GEOTECHNICAL INVESTIGATION
MILPITAS LIBRARY PROJECT
Milpitas, California

City of Milpitas
Milpitas, California

14 September 2004
Project No. 3918.01

Treadwell&Rollo
Environmental and Geotechnical Consultants

Treadwell&Rollo

14 September 2004
Project 3918.01

Mr. Mark Rogge
City of Milpitas
455 East Calaveras Boulevard
Milpitas, California 95035

Subject: Geotechnical Investigation
Milpitas Library
Milpitas, California

Dear Mr. Rogge:

Enclosed is a copy of our geotechnical report for the proposed Milpitas Library project in Milpitas, California. The work presented in this report is in fulfillment of the geotechnical services described in our proposal dated 25 March 2004.

Plans are to construct a 2-story library building and 2-story parking garage. This report contains information regarding subsurface conditions, geologic hazards, foundation design criteria, and site preparation and fill placement criteria. On the basis of the results of this investigation, we conclude the proposed project is feasible. We judge the proposed buildings can be supported on stiffened continuous footings that are deepened around the perimeter of the structures.

Our conclusions and recommendations are based on limited subsurface exploration and laboratory testing programs. Consequently, variations between expected and actual soil conditions may be found at localized areas during construction. Therefore, we should be retained to observe the installation of new foundations and check the compaction of new fill, during which time we may make changes to our recommendations, if deemed necessary.

We appreciate the opportunity to work with you on this project. If you have any questions, please call.

Sincerely yours,
TREADWELL & ROLLO, INC.

Linda H. Liang
Civil Engineer

REGISTERED PROFESSIONAL ENGINEER
HUI JUN LIANG
C60375
EXP. 6/2006
CIVIL
STATE OF CALIFORNIA

Dean H. Iwasa
Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
DEAN H. IWASA
GE 2285
Exp. 3/31/06
GEOTECHNICAL
STATE OF CALIFORNIA

39180102.OAK

GEOTECHNICAL INVESTIGATION
MILPITAS LIBRARY PROJECT
Milpitas, California

City of Milpitas
Milpitas, California

14 September 2004
Project No. 3918.01

Treadwell&Rollo
Environmental and Geotechnical Consultants

Treadwell&Rollo

TABLE OF CONTENTS

Treadwell&Rollo

LIST OF FIGURES

APPENDIX A

Treadwell&Rollo

GEOTECHNICAL INVESTIGATION
MILPITAS LIBRARY PROJECT
Milpitas, California

1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed Milpitas Library project in Milpitas, California. The site is at the southeastern corner of the intersection of North Main Street and Weller Lane, as indicated on Figure 1. This report was prepared in accordance with the geotechnical services described in our proposal dated 25 March 2004.

The project site includes the following properties:

- portion of Assessor Parcel No. (APN) 28-24-014
- APN 28-24-015
- APN 28-24-016
- portion of APN 28-24-017
- portion of APN 28-24-018
- APN 28-24-019
- APN 28-24-020
- APN 28-24-026
- portion of Windsor Street that lies east of APN 28-24-019 and APN 28-24-020.

The approximate project limits and the locations of the properties are shown on Figure 2. Parcel 28-24-019 is currently occupied by the historic Milpitas Grammar School building, an existing parking lot, and an existing corporation yard used by the City of Milpitas. The historic Milpitas Grammar School building is a one-story structure that was completed in about 1915. Several automobile repair, towing, and storage businesses occupy the parcels at APN 28-24-014, 28-24-020, and 28-24-026. The remaining parcels are primarily used as outdoor storage yards and corporation yards for the City of Milpitas.

The ground surface of the project site appears to be relatively flat. However, a topographic survey of the site was not available to confirm our observations.

2.0 PROJECT DESCRIPTION

We understand the proposed Milpitas Library project will consist of incorporating the existing historic Milpitas Grammar School building as part of a new, 60,000-square-foot, 2-story, public library structure, and constructing a new 2-story parking garage to the east and south of the library. The conceptual layout of the proposed library and garage project are shown on the Site Plan, Figure 3. The project will also include the installation of new underground utilities, construction of new asphalt-paved parking areas and driveways, and construction of concrete walkways and flatwork.

3.0 SCOPE OF SERVICES

We investigated the subsurface conditions at the site by drilling borings, performing cone penetrometer tests (CPTs), collecting soil samples, and performing laboratory tests and engineering analyses. On the basis of our geotechnical investigation, we developed conclusions and recommendations regarding:

- soil and groundwater conditions at the site
- site seismicity
- seismic hazards, including ground rupture and soil liquefaction
- appropriate seismic hazards mitigation measures, as necessary
- appropriate foundation type(s) for the proposed structures

- design criteria for the recommended foundation type(s), including criteria for vertical and lateral support of the structures
- estimates of total and differential foundation settlement
- site preparation and grading, including criteria for fill quality and compaction
- soil profile type and near-source factors as per the 2001 California Building Code
- pavement design
- soil corrosivity
- construction considerations.

In addition, our original scope of services included vibration monitoring to evaluate the effects of train vibrations on the proposed parking structure and library building. However, after contacting Union Pacific, we found that train service along the railroad tracks near the project site has been suspended, and therefore, a train schedule was not available. We subsequently researched applicable criteria for acceptable levels of noise and vibration produced by trains adjacent to new structures, and our findings are presented in this report.

Concurrent with this geotechnical investigation, we are also providing environmental services for the project. The results of our environmental studies will be submitted in a separate report.

4.0 FIELD INVESTIGATION AND LABORATORY TESTING

Subsurface conditions at the project site were explored by drilling six test borings (B-1 though B-6) and performing six CPTs (CPT-1 through CPT-6) at the approximate locations indicated on Figure 3. Details of the field exploration activities are described in the following sections of this report.

4.1 Borings and Soil Sampling

The six borings drilled during this geotechnical investigation were advanced using rotary-wash drilling equipment to a depth of 100.5 feet below the existing ground surface. During drilling, our engineer logged the materials encountered and obtained samples for visual classification and laboratory testing. Logs of the borings are presented in Appendix A as Figures A-1 through A-6. The soil encountered in the borings was classified according to the soil classification system described on Figure A-7.

Soil samples were obtained using two types of split-barrel samplers:

- Sprague and Henwood (S&H) sampler with a 3.0-inch-outside diameter and 2.43-inch-inside diameter; this sampler uses 2.5-inch-diameter, 6-inch-long brass and stainless steel liners.
- Standard Penetration Test (SPT) sampler with a 2.0-inch-outside diameter and 1.38-inch-inside diameter.

Both samplers were driven with a 140-pound, above-ground hammer falling 30 inches. The blow counts required to drive the S&H sampler the final 12 inches of an 18-inch drive were converted to approximate SPT N-values using a factor of 0.6 and are shown on the boring logs. Where the SPT sampler was used, the actual blow counts are shown on the logs. Samples of soft soil were obtained by hydraulically pushing 36-inch-long Shelby tubes (3.0-inch outside diameter and 2.875-inch inside diameter) into the soil.

The soil samples from the borings were re-examined at our office to confirm soil classification and to select representative samples for testing. Representative samples were tested to measure moisture content, dry density, fines content, grain size distribution, plasticity (Atterberg limits), shear strength, and consolidation properties. In addition, soil samples were tested to measure the resistance value (R-value) and evaluate corrosion potential of the near-surface soil. The laboratory test results are presented on the boring logs and in Appendix B.

Upon completion of the field investigation, the borings were backfilled with cement grout, while under the observation of an inspector with the Santa Clara Valley Water District. The soil cuttings and drilling fluid produced during our work were placed in four 55-gallon drums and stored at an on-site location designated by a representative of the City of Milpitas.

4.2 Cone Penetration Tests

On 13 and 25 May 2004, six CPTs were performed within the vicinity of the proposed library and parking garage, as indicated on Figure 3. CPTs were performed by hydraulically pushing a 1.4-inch-diameter, cone-tipped probe into the ground. The cone at the end of the probe measured tip resistance and a sleeve behind the cone tip measured frictional resistance. A small, porous stone between the cone and the friction sleeve monitored pore pressures in the soil during penetration. Electrical components within the cone continuously measured soil parameters during the entire depth of probing. Soil data, including tip resistance, frictional resistance, porewater pressure, and probe inclination were recorded in the field and transferred to a computer. Accumulated data were processed by the computer to provide engineering information such as the soil type and approximate strength characteristics of the material encountered. The CPTs were advanced to a depth of 100 feet below the existing ground surface. CPT summaries, which show tip resistance, local friction, approximate strength values, and an interpreted soil profile are presented in Appendix A as Figures A-8 through A-13. A classification chart based on standard electronic cone penetrometer measurements is presented as Figure A-14.

5.0 SUBSURFACE CONDITIONS

The results of our field investigation indicate the site is generally blanketed by up to 10 feet of stiff clay. Atterberg limits tests performed on the near-surface clay indicate it is highly expansive[1] (see Appendix B). The near-surface clay layer is underlain by medium stiff to very

[1] Expansive soil undergoes volume changes with changes in water content, i.e., it shrinks when drying and expands when wetted.

stiff clay over a layer of saturated granular soil consisting of gravel, clayey and silty sand, and sand with varying amounts of clay, silt, and gravel. The granular soil layer is present at a depth of about 13-1/2 to 21 feet below the existing ground surface and ranges from about 3-1/2 to 20-1/2 feet thick. The upper part of the granular soil layer is loose to medium dense; the lower portion is medium dense to dense. Beneath the granular soil layer, we generally encountered layers of stiff to hard clay and silt with varying amounts of sand and gravel. Occasional isolated layers of loose to dense sand, and silty and clayey sand are present within the silt and clay layers, as indicated on the logs of borings and CPTs presented in Appendix A. A slight petroleum odor was identified in the clayey soil from boring B-4 at a depth of 10 feet below the existing ground surface.

During our investigation, the groundwater level was measured in borings B-1, B-3, and B-4 at a depth of 6-1/2 feet below the existing ground surface. While performing CPT-1 through CPT-6, the groundwater level was measured at depths between 7.0 and 9.7 feet below the existing ground surface.

6.0 REGIONAL SEISMICITY

The major active faults in the area are the Hayward, Calaveras, Monte Vista, and San Andreas Faults. These and other faults of the region are shown on Figure 4. For each of the active faults, the distance from the site and estimated maximum Moment magnitude[2] (California Division of Mines and Geology 1996) event are summarized in Table 1.

---

2 Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

TABLE 1.
Regional Faults and Seismicity

Fault Segment	Approximate Distance from Site (km)	Direction from Site	Maximum Magnitude
Hayward (Southeast Extension)	3.1	Northeast	6.4
Hayward (Total)	7.1	Northeast	7.1
Hayward (South)	7.1	Northeast	6.9
Calaveras (North)	8.8	East	7.0
Calaveras (Central)	8.9	East	6.6
Monte Vista	20	Southwest	6.8
San Andreas (1906 Event)	26	Southwest	7.9
San Andreas (Peninsula)	26	Southwest	7.2
San Andreas (Santa Cruz Mountains)	30	South	7.2
Greenville (South)	32	Northeast	6.9
Sargent	33	South	6.8
Mount Diablo Thrust	34	North	6.7
Greenville (Central)	35	Northeast	6.7
Great Valley – 6	37	Northeast	6.7
Great Valley – 7	38	Northeast	6.7
Zayante-Vergeles	39	South	6.8
Greenville (North)	45	North	6.6
San Gregorio (North)	46	Southwest	7.3
Hayward (North)	46	Northwest	6.6
Concord	51	North	6.5

Figure 4 also shows the earthquake epicenters for events with magnitudes greater than 5.0 from January 1800 through January 1996. Since 1800, four major earthquakes have been recorded on the San Andreas Fault. In 1836, an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale (Figure 5) occurred east of Monterey Bay on the San Andreas Fault (Toppozada and Borchardt 1998). The estimated Moment magnitude, M_w, for this earthquake is about 6.25. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to a M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas Fault from Shelter Cove to San Juan Bautista approximately 430 kilometers in length. It had a maximum intensity of XI (MM), a M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The most recent earthquake to affect the Bay Area was the Loma Prieta Earthquake of 17 October 1989, in the Santa Cruz Mountains with a M_w of 6.9, approximately 44 kilometers from the site.

In 1868, an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward Fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably a M_w of about 6.5) was reported on the Calaveras Fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake (M_w = 6.2).

In 2002, the Working Group on California Earthquake Probabilities (WGCEP 2002) at the U.S. Geological Survey (USGS) predicted a 62 percent probability of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area by the year 2032. More specific estimates of the probabilities for different faults in the Bay Area are presented in Table 2.

TABLE 2.
WGCEP (2002) Estimates of 30-Year Probability (2003 to 2032) of a Magnitude 6.7 or Greater Earthquake

Fault	Probability (percent)
Hayward-Rodgers Creek	27
San Andreas	21
Calaveras	11
San Gregorio	10
Concord-Green Valley	4
Greenville	3
Mount Diablo Thrust	3

7.0 DISCUSSION AND CONCLUSIONS

On the basis of our subsurface investigation, we conclude the site can be developed as planned, provided the recommendations presented in this report are incorporated into the project plans and specifications, and implemented during construction. The primary geotechnical concerns are the presence of expansive near-surface soil and the potential for earthquake-induced differential settlement resulting from post-liquefaction densification of granular soil layers. Our discussion of these and other issues are presented in the remainder of this report.

7.1 Geologic and Seismic Hazards

We evaluated geologic hazards at the site, which included the risk of surface faulting and the occurrence of soil liquefaction. Historically, ground surface displacements closely follow the traces of geologically young faults. Based on our study, we conclude the site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act, and no known active or potentially active faults exist on the site. Although the remote possibility exists for future faulting in areas where no faults previously existed, we judge the risk of surface faulting at the subject site is low.

We evaluated the potential for earthquake-induced ground shaking at the site and concluded the site may experience strong to very strong shaking during a major earthquake on any of the nearby faults.

Soil liquefaction is a phenomenon where loose, saturated, cohesionless soil experiences a temporary loss of strength during strong cyclic loading such as that imposed by earthquakes. Typically, liquefaction potential increases with increased duration and magnitude of cyclic loading. We reviewed a map titled *State of California, Seismic Hazard Zones, Milpitas Quadrangle, Preliminary Review Map,* dated on 19 April 2001, and concluded the proposed project site lies within an area where the historic occurrence of liquefaction indicates a potential for permanent ground displacement.

On the basis of our analysis of the data from the test borings and CPTs, we conclude an approximately 2- to 8-1/2-foot-thick layer of loose to medium dense granular soil is present below the upper clay layers. This granular soil layer is susceptible to liquefaction during a moderate to large earthquake. We conclude the potential for lurch cracking and the ejection of liquefied soil to the ground surface in the form of sand boils is low. However, ground surface settlement can occur as the excess pore pressure in the liquefied soil dissipates. Using the procedure outlined by Ishihara and Yoshimine (1990), we estimate the ground surface may settle up to 2-1/2 inches after a major earthquake on a nearby portion of one of the active faults. Differential settlement is estimated to be up to about 1-1/2 inches across a 30-foot distance.

7.2 Foundation Considerations

On the basis of our geotechnical investigation, we conclude the foundations of the proposed library and parking structure can be adversely affected by:

- shrinking and swelling of the near-surface moderately expansive soil
- total and differential liquefaction-induced settlement.

The proposed project site is primarily blanketed by existing pavement consisting of between one and four inches of asphalt-concrete over about six inches of aggregate base, except near boring B-4 where only a four-inch-thick layer of gravel was encountered at the ground surface. The pavement sections are generally underlain by highly expansive clay. Expansive near-surface soil may undergo large volume changes during seasonal fluctuations in moisture content, which can cause cracking of foundations and floor slabs. Therefore, the proposed foundations and slabs should be designed and constructed to resist the effects of expansive near-surface soil. These effects can be mitigated by moisture-conditioning the expansive soil, supporting foundations below the zone of severe moisture change, and/or designing foundations to resist differential movement associated with expansive soil.

As previously described, we estimate that total liquefaction-induced settlement could be up to approximately 2-1/2 inches, with approximately 1-1/2 inches of differential settlement occurring across a 30-foot distance. This settlement is expected to occur during and immediately after a major earthquake on a nearby portion of one of the active faults.

The governing factor in the design of new foundations for the library and parking structures is the potential for total and differential settlement across the project site. We believe the most suitable foundation type for the proposed structures depends on the cost of the foundation system as well as the amount of earthquake-induced settlement that would be acceptable. For this project, we judge stiffened continuous spread footings may be used for support of the proposed buildings. A stiffened foundation would serve to distribute structural loads over wide areas and also have the ability to bridge over limited areas of non-support; therefore, reducing the potential for differential settlement across the building site.

Continuous footings could mitigate the adverse effects of expansive soil by being deepened around the perimeter of the buildings to reduce the potential for moisture change beneath the structures. Deepened continuous footings would block the lateral movement of water and support the foundations below the depth of significant seasonal moisture fluctuations. The proposed library floor may consist of a concrete slab underlain by a water vapor retarder system. The parking structure may use an asphalt-concrete pavement section at the ground floor level. Some settlement-related damage to the building superstructures should be expected during a major earthquake; however, we believe this damage should be readily repairable.

Alternatively, for little or no building damage, we conclude the proposed structures should be supported on a deep foundation system, such as driven piles with a structurally supported ground floor level, or the potentially liquefiable granular soil layer can be strengthen using soil modification techniques, such as compaction grouting. Geotechnical criteria for these alternatives can be provided upon request.

8.0 RECOMMENDATIONS

In accordance with our scope of services, the following sections present our recommendations regarding site preparation, foundation support, slab-on-grade floors, pavement design, seismic design criteria, and construction considerations.

8.1 Site Preparation and Grading

The asphalt-concrete should be removed from the site or stockpiled for later use as fill within new pavement areas with the approval of the project architect. Abandoned underground utilities should be removed from the site and the resulting excavations should be properly backfilled with compacted fill, as recommended in the following sections of this report.

In areas to receive new fill or building loads, the exposed subgrade should be:

- scarified to a depth of at least eight inches

- moisture-conditioned to near the optimum moisture content for granular soil or to at least three percent above the optimum moisture content for clayey soil
- compacted to at least 90 percent relative compaction[3].

At the proposed building areas, the site should be excavated to the planned subgrade elevations. The soil exposed at the bottom of the excavations should be prepared as previously described for areas to receive new fill. If weak material is encountered, these areas should be overexcavated to expose stiff soil and backfilled with either lean concrete or compacted fill.

On-site expansive clay may be used as fill. It should be placed in horizontal lifts not exceeding eight inches in uncompacted thickness, moisture-conditioned to at least three percent above the optimum moisture content, and compacted to at least 90 percent relative compaction.

From a geotechnical standpoint, asphalt-concrete grindings produced during the demolition of the existing asphalt-concrete pavements may be used as fill. On-site fill consisting of asphalt-concrete grindings should be placed in manner similar to those described for the expansive clay fill, except it only needs to be moisture-conditioned to near the optimum moisture content. Also, the asphalt-concrete grindings should be compacted to at least 90 percent relative compaction, unless it is placed as part of the proposed pavement section and/or as fill within the upper six inches of the pavement subgrade. In these situations, we recommend the asphalt-concrete grindings be compacted to at least 95 percent relative compaction. All fill should be approved by the owner, project architect, geotechnical engineer, and environmental consultant prior to use at the site.

Imported fill should: 1) be free of organic matter and non-corrosive, 2) contain no rocks or lumps larger than three inches in greatest dimension, and 3) have a low expansion potential

---

3 Relative compaction refers to the in-placed dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557-91 laboratory compaction procedure.

defined by a liquid limit of less than 40 and a plasticity index lower than 12. It should be placed and compacted in a manner similar those described for asphalt-concrete grindings.

Site grades around new buildings and exterior slabs should be designed so that water will not pond against these improvement. Also, we recommend that water from roof drains be collected in a closed pipe system and directed to an appropriate storm drain inlet.

Backfill for utility trenches and other excavations is also considered fill, and it should be placed and compacted according to the recommendations previously provided in this report. However, if imported clean sand or gravel is used as backfill, it should be compacted to at least 95 percent relative compaction. The material excavated from the trenches can be reused as backfill. Jetting of trench backfill should not be permitted. Special care should be taken when backfilling utility trenches in planned pavement areas because poor compaction may cause excessive settlement, resulting in damage to the new pavement section.

Where utility trenches backfilled with sand or gravel enter building pads, an impermeable plug consisting of native clay or lean concrete should be installed where the trenches enter the structures. Furthermore, where sand- or gravel-backfilled trenches cross planter areas and pass below asphalt-concrete pavements, a similar plug should be placed at the edge of the pavement. The purpose of these recommendations is to reduce the potential for water to become trapped in trenches beneath the proposed buildings or pavements. This trapped water can cause heaving of soil beneath slabs and softening of subgrade soil beneath the floor slab and pavements.

8.2 Continuous Footings

The proposed building may be supported on stiffened, interconnected, continuous spread-type footings resting on stiff clay. New footings should be designed using an allowable bearing pressure of 2,000 pounds per square foot (psf) for dead plus live loads. This value contains a factor of safety of about 2.0 and may be increased by one-third for total loads, including wind or seismic forces. To evaluate the pressure distribution beneath new continuous footings, we recommend using a low modulus of vertical subgrade reaction of 10 pounds per cubic inch (pci). In addition, we recommend the stiffened shallow foundation system be designed to span an unsupported area of 10 feet in diameter at any location within the building interior, and cantilever a distance of five feet at the corners. Continuous spread footings should be at least 18 inches wide, should extend at least 30 inches below the lowest adjacent grade around the perimeters of buildings, and should extend at least 18 inches below the lowest adjacent grade within the interior portions of the proposed buildings. The sides and bottoms of new footing excavations should be kept moist until the reinforcing steel and concrete have been placed. Our field engineer should check the condition of the footing excavations prior to placing the steel and concrete.

Lateral loads can be resisted by a combination of passive pressures on the embedded vertical faces of the footings, and friction along the base of the foundation elements. Passive resistance may be computed using an equivalent fluid weight of 300 pounds per cubic foot (pcf); the upper foot of soil should be ignored unless confined by slabs or pavement. Frictional resistance should be computed using a base friction coefficient of 0.30. These values include a factor of safety of at least 1.5.

The existing interior and perimeter footings of the historic Grammar School building should be tied together using continuous footings or grade beams, and designed using the allowable bearing capacity, modulus of vertical subgrade reaction, and lateral resistance values described above for new building foundations.

8.3 Slab-on-Grade Floor and Moisture Barrier

The library building subgrade should be prepared as described in Section 8.1. To reduce water vapor transmission through the floor slab, we recommend installing a capillary moisture break and a water vapor retarder beneath the floor. A capillary moisture break consists of at least four inches of clean, free-draining gravel or crushed rock. The vapor retarder should meet the requirements for Class C vapor retarders stated in ASTM E1745-97. The vapor retarder should be placed in accordance with the requirements of ASTM E1643-98. These requirements include overlapping seams by six inches, taping seams, and sealing penetrations in the vapor retarder. The vapor retarder should be covered with two inches of sand to aid in curing the concrete and to protect the vapor retarder during slab construction. The particle size of the gravel/crushed rock and sand should meet the gradation requirements presented in Table 3.

TABLE 3.
Gradation Requirements for Capillary Moisture Break and Sand Layer

Sieve Size	Percentage Passing Sieve
Gravel or Crushed Rock	
1 inch	100
3/4 inch	30-75
1/2 inch	5–10
3/8 inch	0-2
Sand	
No. 4	100
No. 200	0-5

The sand overlying the membrane should be moist, but not wet at the time concrete is placed. Excess water trapped in the sand could eventually be transmitted as vapor through the slab. If the sand becomes wet, concrete should not be placed until the sand has been dried or replaced.

Concrete mixes with high water/cement ratios result in excess water in the concrete, which increases the cure time and results in excessive vapor transmission through the slab. Therefore, we recommend concrete for the floor slab should have a low water/cement ratio of less than 0.50. If approved by the project structural engineer, the sand can be eliminated and the concrete can be placed directly over the vapor retarder, provided the water/cement ratio of the concrete does not exceed 0.45 and water is not added in the field. If necessary, workability should be increased by adding plasticizers. In addition, the concrete should be allowed to properly cured.

8.4 Exterior Slabs

Exterior concrete slabs, including sidewalks, should be underlain by at least a six-inch-thick layer of Class 2 aggregate base to reduce the potential for slab cracking. The aggregate base should be compacted to at least 90 percent relative compaction. Prior to placing the aggregate base material, the upper eight inches of the clayey subgrade material should be moisture-conditioned and compacted as previously described in Section 8.1.

8.5 Flexible Pavement Design

The State of California flexible pavement design method was used to develop the recommended asphalt concrete pavement sections. The near-surface soil at the site generally consists of highly expansive clay. On the basis of the laboratory test results performed at the site and our engineering judgement, we selected an R-value of six for design.

For our calculations, we assumed a Traffic Index (TI) of 4.5 for automobile parking areas with occasional trucks, and 5.5 for driveways and truck-use areas. These TIs should be confirmed by the project civil engineer. Table 4 presents our recommendations for asphalt pavement sections.

TABLE 4.
Pavement Section Design

TI	Asphaltic Concrete (inches)	Class 2 Aggregate Base R = 78 (inches)	Aggregate Subbase (Asphalt-Grindings) R = 40 (inches)
4.5	2.5	10	---
4.5	2.5	4	6
5.5	2.5	13	---
5.5	2.5	7	7

Pavement components should conform to the current Caltrans Standard Specifications. The upper six inches of the expansive clay subgrade in pavement areas should be moisture-conditioned to at least three percent above the optimum moisture content and compacted to at least 90 percent relative compaction to provide a smooth non-yielding surface, unless non-expansive soil is exposed in the proposed pavement area. In this situation, the exposed subgrade should be moisture conditioned to near the optimum moisture content and compacted to at least 95 percent relative compaction. Aggregate base and subbase materials should be compacted to at least 95 percent relative compaction.

8.6 Seismic Design

The proposed structures should be designed in accordance with the 2001 California Building Code (2001 CBC) or as recommended by the project structural engineer. Based on the results of our subsurface investigation, we recommend using the following criteria for structures with predominant periods no greater than 0.5 seconds:

- Seismic Zone Factor 4
- Soil Profile Type S_D for a stiff soil site
- Seismic Source Type B
- Closest distance to known seismic source of approximately 3.1 kilometers
- Near Source Factor N_a of 1.19
- Near Source Factor N_v of 1.45.

For structures with periods greater than 0.5 seconds, we recommend performing a site-specific response analysis to evaluate the performance of the proposed structures on a site underlain by potentially liquefiable soil.

8.7 Soil Corrosivity

We evaluated the corrosivity potential of the near-surface clayey soil using a numerical corrosivity scale procedure (American Water Works Association C-105 Standard). The method uses soil parameters, such as resistivity, pH, redox potential, and moisture content to evaluate the potential for soil to adversely impact cast iron alloys. Based on our evaluation, we conclude the soil has a high potential for corroding cast iron alloys. Consequently, we recommend metallic underground utilities and fittings be designed and constructed to resist the adverse impacts associated with potentially corrosive near-surface soil. A corrosion specialist should be consulted for corrosion protection design criteria, such as epoxy-coatings and cathodic protection systems. Refer to Appendix B for corrosivity test results.

8.8 Train Noise and Vibrations

We reviewed noise and vibration design criteria related to the construction and operation of the Bay Area Rapid Transit (BART) system extensions. It is our recommendation that a similar criteria be discussed and implemented with future users of the rail lines adjacent to the proposed Milpitas Library project site. BART requires that the train segment design consultant conduct noise and vibration studies to determine the final requirements for the limits and type of sound walls, track anchorage, and sound and vibration absorption techniques for the proposed extension. The studies should identify and evaluate alternative abatement techniques, noise and vibration reduction potential, and costs. Typical criterion for the maximum airborne noise from train operations near a library is a "maximum pass-by noise level" of 75 dBA. For ground-borne noise and vibration, the typical maximum levels for "pass-by" noise and vibration from train operations near a library are 35 to 40 dBA and 75 dB re 10^{-6} inch per second, respectively.

9.0 GEOTECHNICAL SERVICES DURING CONSTRUCTION

Prior to construction, Treadwell & Rollo, Inc. should review the project plans and specifications to verify that they conform with the intent of our recommendations. During construction, our field engineer should provide on-site observation and testing during site preparation, placement and compaction of fill, and installation of building foundations. These observations will allow us to compare actual with anticipated conditions and to verify that the contractor's work conforms with the geotechnical aspects of the plans and specifications.

10.0 LIMITATIONS

The conclusions and recommendations presented in this report are the result of limited engineering studies based on our interpretation of the existing geotechnical conditions and available subsurface data. Actual subsurface conditions may vary. If any variations or unforeseen conditions are encountered during construction, or if the proposed construction differs from that which is described in this report, Treadwell & Rollo should be notified so that supplemental recommendations can be made.

REFERENCES

California Division of Mines and Geology, 1996, *Probabilistic Seismic Hazard Assessment for the State of California*, CDMG Open-File Report 96-08.

California Division of Mines and Geology, 2001, *Seismic Hazard Zones, Milpitas Quadrangle, Preliminary Review Map, Released: April 17, 200, www.consrv.ca.gov/cgs/.*

International Conference of Building Officials (ICBO), 1998, *Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada*, February.

Tokimatsu, K. and H.B. Seed, 1984, *Simplified Procedures for the Evaluation of Settlements in Clean Sands*, Report No. UCB/GT-84/16, Earthquake Engineering Research Center, University of California, Berkeley.

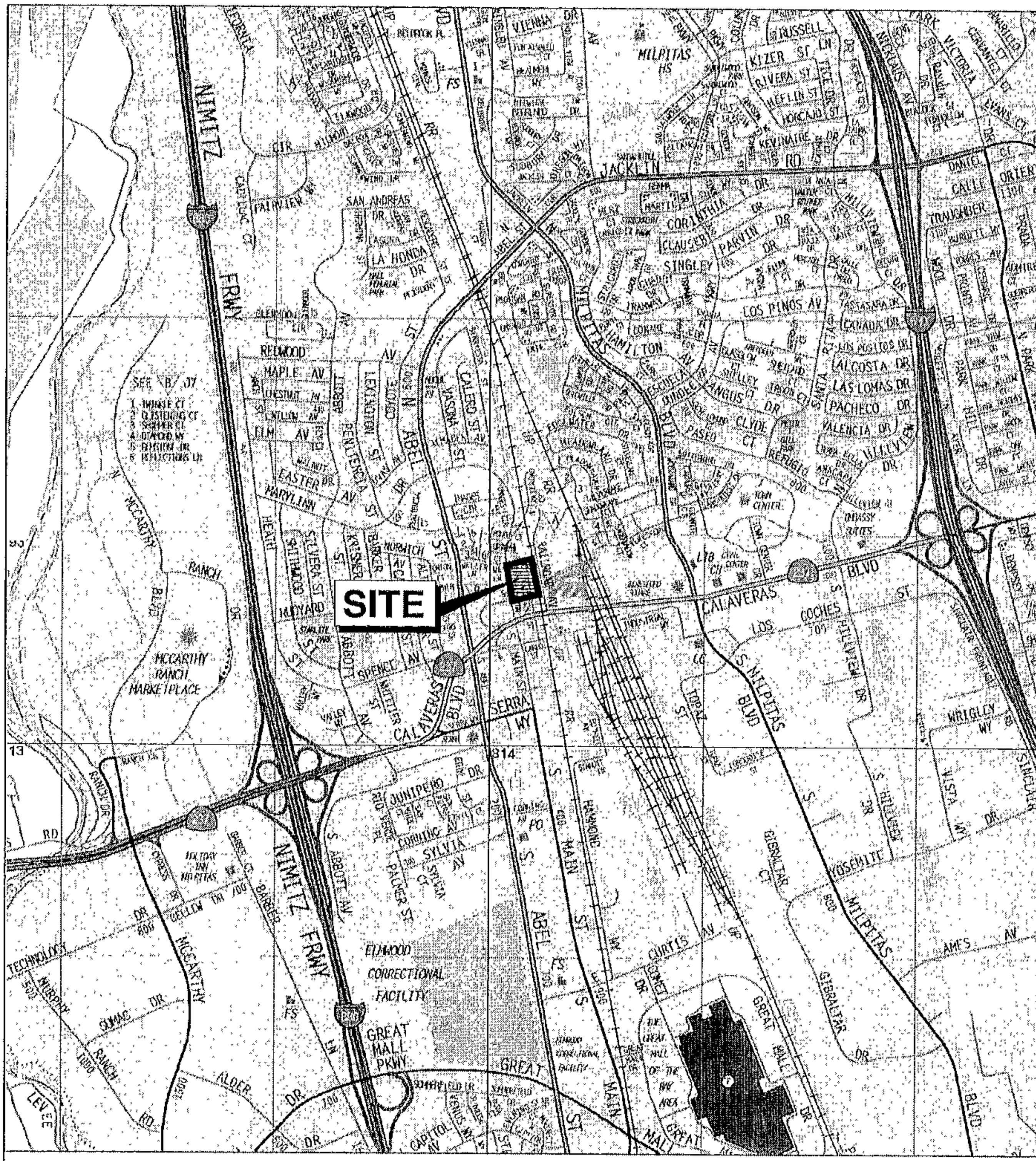
Toppozada, T. R. and Borchardt G., 1998, *Re-Evaluation of the 1836 "Hayward Fault" and the 1838 San Andreas Fault earthquakes, Bulletin of Seismological Society of America*, 88(1), 140-159.

Townley, S.D. and Allen, M.W., 1939, *Descriptive Catalog of Earthquakes of the Pacific Coast of the United States 1769 to 1928*; Bulletin of the Seismological Society of America, Vol. 29, No. 1; 1939.

Working Group on California Earthquake Probabilities (WGCEP), 1999, *Earthquake probabilities in the San Francisco Bay region: 2000 to 2030 – A summary of findings.* Open File Report 99-517.

FIGURES

FIGURES



Base map: The Thomas Guide
Santa Clara County
1999

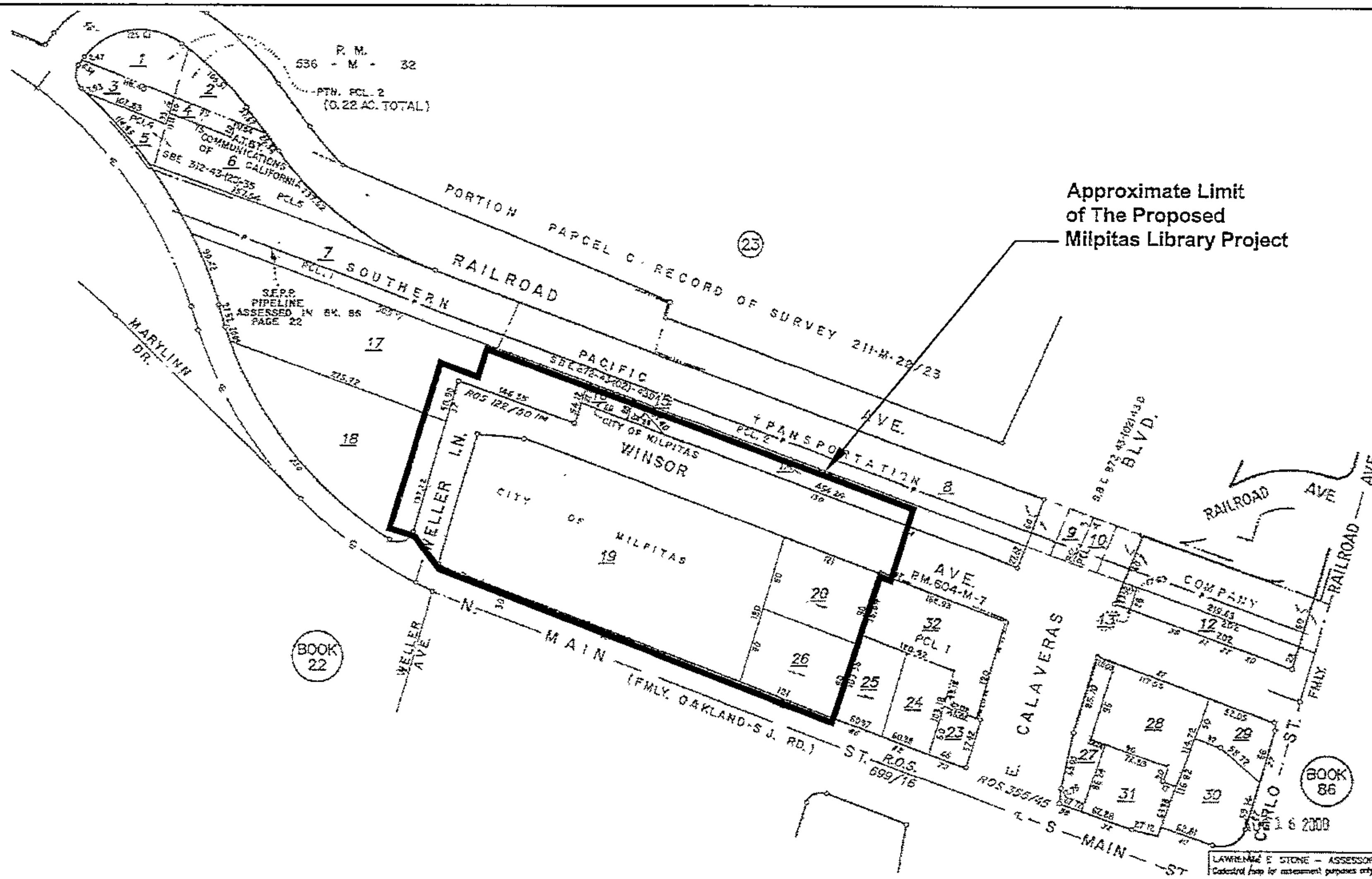
0 1/4 1/2 Mile
Approximate scale

MILPITAS LIBRARY
Milpitas, California

SITE LOCATION MAP

Treadwell&Rollo

Date 06/10/04	Project No. 3918.01	Figure 1



MILPITAS LIBRARY
Milpitas, California

ASSESSOR'S PARCEL MAP

Date 07/06/04	Project No. 3918.01	Figure 2

Treadwell&Rollo

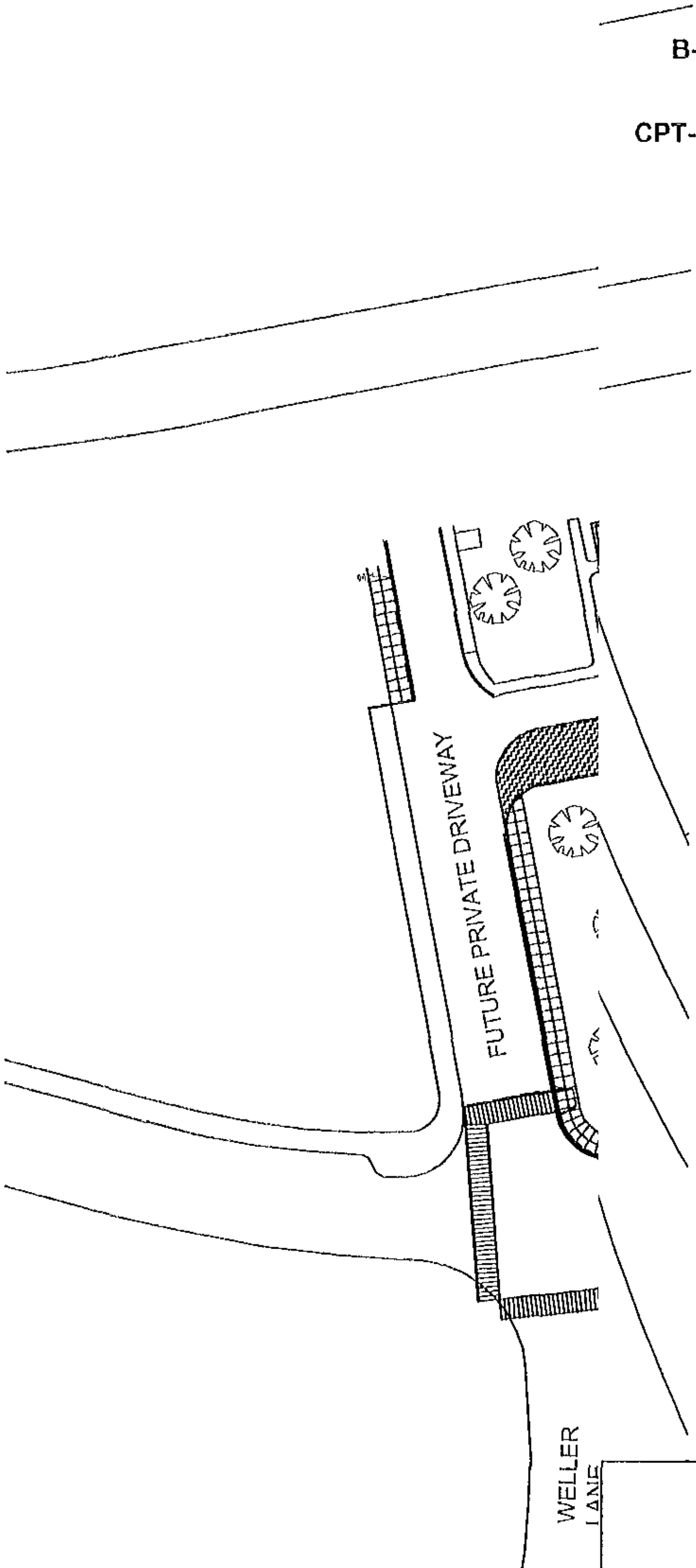
Reference: Office of County Assesor, Santa Clara County, California, Book 28, Page 24.

391801_AssessorsParcelMap

EXPLANATION

B-1 — Approximate location of test boring by Treadwell & Rollo, Inc., May 2004

CPT-1 ▲ — Approximate location of cone penetration test by Treadwell & Rollo, Inc., May 2004



0 40 80 Feet

Approximate scale

MILPITAS LIBRARY
Milpitas, California

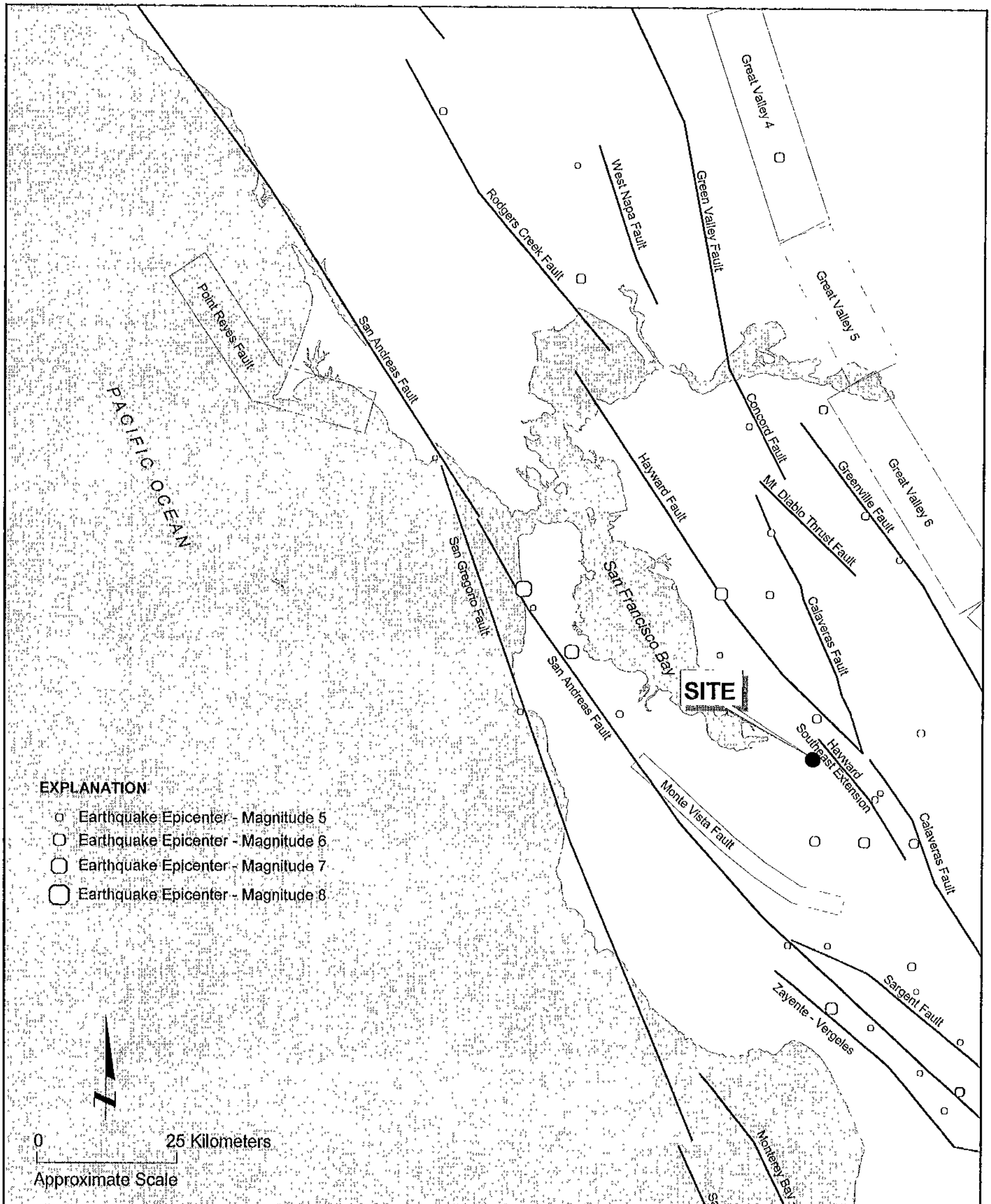
SITE PLAN

Date 07/12/04	Project No. 3918.01	Figure 3

Treadwell&Rollo

39:801_SitePlan.dwg

Reference: Milpitas Public Library Program Diagram, pr



NOTES:
Digitized data for fault coordinates and earthquake catalog was developed by the California Department of Conservation Division of Mines and Geology. The historic earthquake catalog includes events from January 1800 to December 2000.

MILPITAS LIBRARY Milpitas, California	**MAP OF MAJOR FAULTS AND EARTHQUAKE EPICENTERS IN THE SAN FRANCISCO BAY AREA**
Treadwell&Rollo	Date: 06/10/04 | Project No. 3918.01 | Figure: 4

I **Not felt by people, except under especially favorable circumstances. However, dizziness or nausea may be experienced.**
Sometimes birds and animals are uneasy or disturbed. Trees, structures, liquids, bodies of water may sway gently, and doors may swing very slowly.

II **Felt indoors by a few people, especially on upper floors of multi-story buildings, and by sensitive or nervous persons.**
As in Grade I, birds and animals are disturbed, and trees, structures, liquids and bodies of water may sway. Hanging objects swing, especially if they are delicately suspended.

III **Felt indoors by several people, usually as a rapid vibration that may not be recognized as an earthquake at first. Vibration is similar to that of a light, or lightly loaded trucks, or heavy trucks some distance away. Duration may be estimated in some cases.**
Movements may be appreciable on upper levels of tall structures. Standing motor cars may rock slightly.

IV **Felt indoors by many, outdoors by a few. Awakens a few individuals, particularly light sleepers, but frightens no one except those apprehensive from previous experience. Vibration like that due to passing of heavy, or heavily loaded trucks. Sensation like a heavy body striking building, or the falling of heavy objects inside.**
Dishes, windows and doors rattle; glassware and crockery clink and clash. Walls and house frames creak, especially if intensity is in the upper range of this grade. Hanging objects often swing. Liquids in open vessels are disturbed slightly. Stationary automobiles rock noticeably.

V **Felt indoors by practically everyone, outdoors by most people. Direction can often be estimated by those outdoors. Awakens many, or most sleepers. Frightens a few people, with slight excitement; some persons run outdoors.**
Buildings tremble throughout. Dishes and glassware break to some extent. Windows crack in some cases, but not generally. Vases and small or unstable objects overturn in many instances, and a few fall. Hanging objects and doors swing generally or considerably. Pictures knock against walls, or swing out of place. Doors and shutters open or close abruptly. Pendulum clocks stop, or run fast or slow. Small objects move, and furnishings may shift to a slight extent. Small amounts of liquids spill from well-filled open containers. Trees and bushes shake slightly.

VI **Felt by everyone, indoors and outdoors. Awakens all sleepers. Frightens many people; general excitement, and some persons run outdoors.**
Persons move unsteadily. Trees and bushes shake slightly to moderately. Liquids are set in strong motion. Small bells in churches and schools ring. Poorly built buildings may be damaged. Plaster falls in small amounts. Other plaster cracks somewhat. Many dishes and glasses, and a few windows break. Knickknacks, books and pictures fall. Furniture overturns in many instances. Heavy furnishings move.

VII **Frightens everyone. General alarm, and everyone runs outdoors.**
People find it difficult to stand. Persons driving cars notice shaking. Trees and bushes shake moderately to strongly. Waves form on ponds, lakes and streams. Water is muddied. Gravel or sand stream banks cave in. Large church bells ring. Suspended objects quiver. Damage is negligible in buildings of good design and construction; slight to moderate in well-built ordinary buildings; considerable in poorly built or badly designed buildings, adobe houses, old walls (especially where laid up without mortar), spires, etc. Plaster and some stucco fall. Many windows and some furniture break. Loosened brickwork and tiles shake down. Weak chimneys break at the roofline. Cornices fall from towers and high buildings. Bricks and stones are dislodged. Heavy furniture overturns. Concrete irrigation ditches are considerably damaged.

VIII **General fright, and alarm approaches panic.**
Persons driving cars are disturbed. Trees shake strongly, and branches and trunks break off (especially palm trees). Sand and mud erupts in small amounts. Flow of springs and wells is temporarily and sometimes permanently changed. Dry wells renew flow. Temperatures of spring and well waters varies. Damage slight in brick structures built especially to withstand earthquakes; considerable in ordinary substantial buildings, with some partial collapse; heavy in some wooden houses, with some tumbling down. Panel walls break away in frame structures Decayed pilings break off. Walls fall. Solid stone walls crack and break seriously. Wet grounds and steep slopes crack to some extent. Chimneys, columns, monuments and factory stacks and towers twist and fall. Very heavy furniture moves conspicuously or overturns.

IX **Panic is general.**
Ground cracks conspicuously. Damage is considerable in masonry structures built especially to withstand earthquakes; great in other masonry buildings - some collapse in large part. Some wood frame houses built especially to withstand earthquakes are thrown out of plumb, others are shifted wholly off foundations. Reservoirs are seriously damaged and underground pipes sometimes break.

X **Panic is general.**
Ground, especially when loose and wet, cracks up to widths of several inches; fissures up to a yard in width run parallel to canal and stream banks. Landsliding is considerable from river banks and steep coasts. Sand and mud shifts horizontally on beaches and flat land. Water level changes in wells. Water is thrown on banks of canals, lakes, rivers, etc. Dams, dikes, embankments are seriously damaged. Well-built wooden structures and bridges are severely damaged, and some collapse. Dangerous cracks develop in excellent brick walls. Most masonry and frame structures, and their foundations are destroyed. Railroad rails bend slightly. Pipe lines buried in earth tear apart or are crushed endwise. Open cracks and broad wavy folds open in cement pavements and asphalt road surfaces.

XI **Panic is general.**
Disturbances in ground are many and widespread, varying with the ground material. Broad fissures, earth slumps, and land slips develop in soft, wet ground. Water charged with sand and mud is ejected in large amounts. Sea waves of significant magnitude may develop. Damage is severe to wood frame structures, especially near shock centers, great to dams, dikes and embankments, even at long distances. Few if any masonry structures remain standing. Supporting piers or pillars of large, well-built bridges are wrecked. Wooden bridges that "give" are less affected. Railroad rails bend greatly and some thrust endwise. Pipe lines buried in earth are put completely out of service.

XII **Panic is general.**
Damage is total, and practically all works of construction are damaged greatly or destroyed. Disturbances in the ground are great and varied, and numerous shearing cracks develop. Landslides, rock falls, and slumps in river banks are numerous and extensive. Large rock masses are wrenched loose and torn off. Fault slips develop in firm rock, and horizontal and vertical offset displacements are notable. Water channels, both surface and underground, are disturbed and modified greatly. Lakes are dammed, new waterfalls are produced, rivers are deflected, etc. Surface waves are seen on ground surfaces. Lines of sight and level are distorted. Objects are thrown upward into the air.

MILPITAS LIBRARY Milpitas, California	**MODIFIED MERCALLI INTENSITY SCALE**		
Treadwell&Rollo	Date: 06/10/04	Project No. 3918.01	Figure: 5

APPENDIX A

Treadwell&Rollo

APPENDIX A
Logs of Test Borings and Cone Penetration Test Results

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-1

Boring location: See Site Plan, Figure 3

Logged by: C. Divis

Date started: 5/11/04 | Date finished: 5/12/04

Drilling method: Rotary wash

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety

Sampler: Sprague & Honwood (S&H), Shelby Tube (ST), Standard Penetration Test (SPT)

DEPTH (feet)	Sampler Type	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
				4-inch-thick layer of asphalt-concrete over 6-inch-thick layer of aggregate base						
1–7			CH	CLAY (CH) dark gray, stiff, moist						
3	S&H	10		R-value = 16, see Appendix B LL = 58, PI = 39, see Appendix B					27.3	96
5	S&H	8								
6.5				▽ (5/12/04)					25.1	100
7	ST	350 psi		Consolidation Test, see Appendix B						
7–14.5			CL	CLAY (CL) olive, very stiff, wet						
10	S&H	8		Unconsolidated Undrained Triaxial Test, see Appendix B	TxUU	600	1,400		18.7	113
11				stiff	PP		1,750			
14				soft						
14.5–17			SC	CLAYEY SAND (SC) olive, very loose, wet						
15	S&H	3								
17–21			SP-SM	SAND with SILT (SP-SM) olive-gray, medium dense, wet, fine to medium sand						
19.5								8.4		
20	SPT	16								
21–24.5			SM	SILTY SAND (SM) olive-gray, medium dense, wet, fine sand						
24.5–30			SP	SAND with GRAVEL (SP) olive-gray, medium dense, wet, coarse sand, fine to coarse gravel						
25	SPT	24								
29.5								4.1		
30	SPT	28								

Treadwell&Rollo

Project No.: 3918.01 | Figure. A-1a

PROJECT: **MILPITAS LIBRARY**
Milpitas, California

Log of Boring B-1

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	SPT		28	SP	SAND with GRAVEL (SP) (continued)						
31											
32											
33											
34											
35	SPT		24								
36				CL	CLAY (CL) olive, wet						
37					clayey sand lens						
38				CL	CLAY with SAND (CL) olive, very stiff, wet, fine sand, with interbedded sand layers						
39											
40	S&H		20								
41											
42					increase in sand content between 42 to 43.5 feet						
43											
44					Consolidated Undrained Triaxial Test, see Appendix B	TxCU	1,930	3,220		19.9	112
45	S&H		26								
46											
47											
48											
49											
50	S&H		12		stiff						
51											
52											
53											
54											
55											
56											
57											
58											
59											
60	S&H		16		very stiff						

Treadwell&Rollo

Project No.: 3918.01

Figure: A-1b

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-1

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		16		CLAY with SAND (CL) (continued)						
61											
62											
63											
64											
65											
66											
67											
68											
69											
70	S&H		25								
71											
72											
73											
74											
75				CL							
76											
77											
78											
79											
80	S&H		44		hard						
81											
82											
83											
84											
85											
86											
87											
88											
89					very stiff						
90	S&H		23								

TEST GEOTECH LOG 391801.GPJ TR.GDT 7/14/04

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-1
		PAGE 4 OF 4

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		23		CLAY with SAND (CL) (continued)						
91											
92											
93											
94											
95				CL							
96											
97											
98											
99					hard						
100	S&H		35								
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

Boring terminated at a depth of 100.5 feet.
Boring backfilled with cement grout.
Groundwater encountered at a depth of 6.5 feet.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.

Treadwell&Rollo

Project No.: 3918.01 | Figure: A-1d

TEST GEOTECH LOG 391801.GPJ TR.GDT 7/14/04

PROJECT: ***MILPITAS LIBRARY*** Milpitas, California

Log of Boring B-2

Boring location:	See Site Plan, Figure 3
Date started:	5/13/04
Date finished:	5/13/04
Drilling method:	Rotary wash
Hammer weight/drop:	140 lbs./30 inches
Hammer type:	Safety
Sampler:	Sprague & Henwood (S&H), Shelby Tube (ST), Standard Penetration Test (SPT)
Logged by:	C. Divis

LABORATORY TEST DATA

DEPTH (feet)	Sampler Type	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–1				4-inch-thick layer of asphalt-concrete over 6-inch-thick layer of aggregate base						
1–6			CH	CLAY (CH) dark gray, stiff, moist, trace of organics and sand						
3	S&H	10		Corrosivity Test, see Appendix B; LL = 64, PI = 44, see Appendix B					27.6	94
5	S&H	9								
6.5–10			CL	CLAY (CL) olive-gray, medium stiff, wet						
9	ST	Push		Unconsolidated Undrained Triaxial Test, see Appendix B; Consolidation Test, see Appendix B	TxUU	600	1,380		20.9	107
									21.0	105
10–13			CL	CLAY with SAND (CL) olive-brown, stiff, wet, fine sand						
11.5					PP		1,250			
13–17			SP-SM	SAND with SILT (SP-SM) brown, medium dense, wet, fine to medium sand						
15	S&H	14						9.8		
17–19.5			SC	CLAYEY SAND (SC) olive-brown, medium dense, wet, fine sand						
19.5–20.5	S&H	10	CL	SANDY CLAY (CL) brown, stiff, wet						
20.5–25			SM	SILTY SAND (SM) gray, medium dense, wet, fine sand						
25	SPT	24						13.1		
25–28			SP-SM	SAND with GRAVEL and SILT (SP-SM) gray, medium dense, wet, medium to coarse sand						
28–30			SP	SAND with GRAVEL (SP) gray, medium dense, wet, medium to coarse sand, fine to coarse gravel						
30	SPT	24								

Treadwell&Rollo

Project No.: 3918.01

Figure: A-2a

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-2

DEPTH (feet)	SAMPLES: Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	SPT		24								
31				CL	CLAY (CL) olive, very stiff, wet						
35	S&H		17								
39					clayey sand lens at 39 to 39.5 feet						
40	SPT		15	CL	SANDY CLAY (CL) olive-brown, stiff to very stiff, wet						
43				SC	CLAYEY SAND with GRAVEL (SC) mottled brown and gray, dense, hard, wet						
45	S&H		36								
47				CL	CLAY (CL) mottled gray and olive, very stiff, wet occasional gravel						
51	S&H		18								
59					fine sand						
60	S&H		16								

TEST GEOTECH LOG 391801.GPJ TR GDT 7/14/04

Treadwell&Rollo

Project No.: 3918.01

Figure: A-2b

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
60–61	S&H		16	CL	CLAY (CL) (continued)						
69–70	S&H		26		increase in sand content, olive						
79–80	S&H		30								
89–90	S&H		28								

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		28		CLAY (CL) (continued)						
91											
92											
93											
94											
95				CL							
96											
97											
98											
99					mottled olive and gray						
100	S&H		25								
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

Boring terminated at a depth of 100.5 feet.
Boring backfilled with cement grout
Groundwater obscured by drilling method.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.

PROJECT:	MILPITAS LIBRARY Milpitas, California	**Log of Boring B-3**

Boring location: See Site Plan, Figure 3

Logged by: C. Divis

Date started: 5/12/04 | Date finished: 5/12/04

Drilling method: Rotary wash

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety

Sampler: Sprague & Henwood (S&H), Shelby Tube (ST), Standard Penetration Test (SPT)

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–1					1-inch-thick layer of asphalt-concrete over 6-inch-thick layer of aggregate base						
1–2.5				SC	CLAYEY SAND (SC) brown, loose to medium dense, dry to moist R-value = 26, see Appendix B (FILL)						
2.5–3.3	S&H		14		CLAY (CH) mottled dark gray and brown, stiff to very stiff, moist, trace of organics						
4–5	S&H		12	CH							
6					▽ (5/13/04)						
7.5					SANDY CLAY (CL) olive-brown, stiff, moist to wet						
9–12	ST		300 psi	CL							
11					very stiff						
13.5					CLAYEY SAND (SC) olive-brown, medium dense, wet, fine sand						
14–15.5	SPT		19	SC							
16				CL	CLAY (CL) dark gray, medium stiff to stiff, wet						
18.5				CL	SANDY CLAY (CL) olive-brown, stiff, wet, fine sand						
19–20.5	S&H		12								
20				SP-SM	SAND with GRAVEL and SILT (SP-SM) brown/black, medium dense, wet						
24–25.5	SPT		18								
25				CL	CLAY (CL) olive-brown, stiff, wet						
29–30	S&H		16		trace of sand						

PROJECT: **MILPITAS LIBRARY** *Milpitas, California*

Log of Boring B-3

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		16	CL	CLAY (CL) (continued)						
34–35	ST		Push		Unconsolidated Undrained Triaxial Test, see Appendix B	TxUU	1,600	1,200		24.5	101
					Consolidation Test, see Appendix B					24.5	99
					stiff to very stiff						
37				CL	CLAY with SAND (CL) olive-brown, stiff to very stiff, wet, fine sand	PP		2,000			
40	S&H		16								
42				CL	CLAY (CL) *mottled tan and olive-brown, very stiff to hard, wet*						
45	S&H		37								
49					very stiff						
50	S&H		16								
55				ML	SILT with SAND (ML) olive-brown, stiff, wet, fine sand						
59–60	S&H		13		Partial Size Distribution, see Appendix B				76.6		

Depth scale: 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		13	ML	SILT with SAND (ML) (continued) LL = 27, PI = 4, see Appendix B						
61											
62											
63											
64											
65					interbedded sand and clay						
66											
67				SM	SILTY SAND (SM) olive, medium dense, wet, fine sand						
68											
69											
70	S&H		24		Partial Size Distribution, see Appendix B PI = Non-Plastic, see Appendix B				48.4		
71											
72											
73					interbedded sand and silt						
74											
75											
76											
77											
78				SM	SILTY SAND (SM) gray, dense, wet, fine to medium sand						
79				CL	CLAY (CL) olive-gray, hard, wet						
80	S&H		32								
81											
82											
83											
84											
85											
86											
87											
88											
89					olive-brown, very stiff						
90	S&H		19								

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-3

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		19	CL	CLAY (CL) (continues)						
100	S&H		28								

Depth scale: 91–120 feet

Boring terminated at a depth of 100 5 feet
Boring backfilled with cement grout
Groundwater encountered at a depth of 6 5 feet.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.

Treadwell&Rollo

Project No.: 3918.01

Figure. A-3d

TEST GEOTECH LOG 391801 GPJ TR GDT 7/14/04

PROJECT: **MILPITAS LIBRARY**
Milpitas, California

Log of Boring B-4

Boring location. See Site Plan, Figure 3
Logged by: C. Divis
Date started. 5/10/04 | Date finished: 5/10/04
Drilling method: Rotary wash
Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety
Sampler. Sprague & Henwood (S&H), Shelby Tube (ST)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					4-inch-thick layer of gravel						
1					CLAY (CH) dark gray, stiff, moist						
2					LL = 53, PI = 34, see Appendix B						
3	S&H		13							23.7	100
4											
5	S&H		10	CH							
6					▽ (5/11/04)						
7											
8											
9											
10	S&H		17		CLAY with SAND (CL) olive-brown, very stiff, wet, fine sand, slight petroleum hydrocarbon odor						
11											
12				CL							
13											
14					CLAY (CL) olive-brown, stiff, wet Unconsolidated Undrained Triaxial Test, see Appendix B Consolidation Test, see Appendix B	TxUU	800	1,040		28.6 30.6	96 90
15	ST		100 to 300 psi								
16											
17				CL		PP		1,750			
18											
19											
20	ST				sand lens at 20 to 21 feet CLAYEY SAND (SC) *olive-brown, loose, wet*						
21											
22	S&H		8	SC							
23											
24					CLAY (CL) *mottled olive-brown and red, very stiff, wet, with variable sand content, fine sand*						
25											
26	S&H		23	CL							
27											
28					CLAY with SAND (CL) *olive-brown, very stiff, wet, fine sand*						
29				CL							
30	S&H		17								

Treadwell&Rollo

Project No.: 3918.01 | Figure: A-4a

PROJECT: **MILPITAS LIBRARY** Milpitas, California

Log of Boring B-4

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		17	CL	SANDY CLAY (CL) (continued)						
31					SANDY CLAY (CL) olive-brown, very stiff, wet, fine sand, occasional gravel						
32											
33											
34											
35	S&H		16								
36				CL							
37											
38											
39					stiff						
40	S&H		13								
41											
42					CLAY (CL) olive-brown, very stiff, wet						
43											
44											
45	S&H		28	CL							
46											
47					SANDY CLAY (CL) olive-brown, stiff, wet, fine sand						
48											
49											
50	S&H		13								
51											
52											
53											
54				CL							
55											
56											
57											
58											
59											
60	S&H		14								

TEST GEOTECH LOG 391801.GPJ TR.GDT 7/14/04

Treadwell&Rollo

Project No.: 3918.01

Figure: A-4b

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-4

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		14		SANDY CLAY (CL) (continued)						
61											
62											
63				CL							
64											
65					CLAY (CL) olive-brown, very stiff, wet						
66											
67											
68											
69					increase in sand content at 70 feet						
70	S&H		26								
71											
72											
73											
74											
75											
76											
77											
78				CL							
79											
80	S&H		29								
81											
82											
83											
84											
85											
86											
87											
88											
89											
90	S&H		22								

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-4
		PAGE 4 OF 4

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		22		CLAY (CL) (continued)						
91											
92											
93											
94											
95				CL							
96											
97											
98											
99					hard						
100	S&H		31								
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

Boring terminated at a depth of 100.5 feet
Boring backfilled with cement grout.
Groundwater encountered at a depth of 6.5 feet.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.

Treadwell&Rollo

Project No.: 3918.01 | Figure: A-4d

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-5

Boring location: See Site Plan, Figure 3

Logged by: L. Liang

Date started: 5/10/04 | Date finished: 5/10/04

Drilling method: Rotary wash

Hammer weight/drop: 140 lbs /30 inches | Hammer type: Safety

Sampler: Sprague & Henwood (S&H), Shelby Tube (ST), Standard Penetration Test (SPT)

DEPTH (feet)	Sampler Type	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–1				3-inch-thick layer of asphalt-concrete over 6-inch-thick layer of aggregate base						
1–3	S&H (2.5–3)	8	SC	CLAYEY SAND with GRAVEL (SC) *brown, loose, moist* (FILL)						
3–9	S&H (4.5–5)	9	CH	CLAY (CH) gray, stiff, wet						
9–13	ST (9–12)	100 to 200 psi	CL	SANDY CLAY (CL) olive-brown, stiff, wet, fine sand						
13–17	S&H (14.5–15)	4	CL	CLAY (CL) olive-brown, medium stiff, wet						
17–24	S&H (19.5–20)	12	SM	SILTY SAND (SM) brown, medium dense, wet, fine sand						
24–25.5	SPT	10	SM	*olive-brown*				43.2		
28–30	SPT (29.5–30)	46	SM	gray, dense						

Treadwell&Rollo

Project No.: 3918.01 | Figure: A-5a

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-5

DEPTH (feet)	Sampler Type	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
30–32	SPT	46	SM	SILTY SAND with GRAVEL (SM) gray, dense, wet, fine to coarse gravel						
32–42	S&H (34–35.5)	13	CL	CLAY with SAND (CL) olive-brown, stiff, wet, occasional gravel						
	SPT (39–40.5)	9								
42–59	ST (44–45.5)	350 psi	CL	CLAY (CL) gray-brown, very stiff, wet						
	S&H (49–50.5)	24								
59–60	S&H	16	SC	CLAYEY SAND (SC)						

Treadwell&Rollo

Project No.: 3918.01 | Figure: A-5b

PROJECT: **MILPITAS LIBRARY** Milpitas, California

Log of Boring B-5

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
60	S&H		16		olive-brown, medium dense, wet						
61				SC							
62					CLAY (CL) olive-brown, very stiff, wet						
63											
64											
65											
66											
67											
68											
69											
70	S&H		19								
71											
72											
73											
74											
75											
76				CL							
77											
78											
79					Consolidated Undrained Triaxial Test, see Appendix B	TxCU	3,283	2,870		22.2	108
80	S&H		35		hard						
81											
82											
83											
84											
85											
86											
87											
88											
89	S&H		26		*very stiff*						
90											

Treadwell&Rollo

Project No.: 3918.01

Figure A-5c

PROJECT: **MILPITAS LIBRARY** Milpitas, California

Log of Boring B-5

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		26		*CLAY (CL) (continued)*						
91											
92											
93											
94											
95				CL							
96											
97											
98											
99											
100	S&H		31								
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

Boring terminated at a depth of 100 5 feet
Boring backfilled with cement grout
Groundwater obscured by drilling method.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.

Treadwell&Rollo

Project No.: 3918.01

Figure: A-5d

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-6

Boring location: See Site Plan, Figure 3

Date started: 5/7/04 | Date finished: 5/7/04

Drilling method: Rotary wash

Hammer weight/drop: 140 lbs./30 inches | Hammer type: 140 lbs./30 inches

Sampler: Sprague & Henwood (S&H), Shelby Tube (ST), Standard Penetration Test (SPT)

Logged by: L. Liang

DEPTH (feet)	Sampler Type	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–1				3-inch-thick layer of asphalt-concrete over 6-inch-thick layer of aggregate base						
1–2			SC	CLAYEY SAND with GRAVEL (SC) brown, moist (FILL)						
2–3	S&H	10	CH	CLAY (CH) gray-brown, stiff, moist. Corrosivity Test, see Appendix B						
5	S&H	13	CH	Unconsolidated Undrained Triaxial Test, see Appendix B	TxUU	400	1,670		29.9	94
7.5			CL	CLAY (CL) olive-brown, stiff, wet, with occasional sand layer						
10	S&H	10	CL							
15			SM	SILTY SAND (SM) brown, loose to medium dense, wet, fine sand						
15–16	ST	350 psi	SM							
20	SPT	10	SM					33.1		
22.5			SP	SAND with GRAVEL (SP) gray, medium dense, wet, coarse sand, fine gravel						
25	SPT	26	SP							
26			GP	GRAVEL with SAND (GP) gray, dense, wet, coarse sand, fine to coarse gravel, occasional cobble						
30	SPT	33	GP							

Treadwell&Rollo

Project No.: 3918.01 | Figure: A-6a

TEST GEOTECH LOG 391801.GPJ TR.GDT 7/14/04

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-6

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	SPT		33	GP	GRAVEL with SAND (GP) (continued)						
31											
32											
33				CL	CLAY with SAND (CL) olive-brown, stiff, wet, fine sand, with occasional gravel and cobble						
34											
35	S&H		13								
36											
37											
38											
39				CL	CLAY (CL) mottled olive and gray, stiff, wet						
40	SPT		9								
41											
42											
43											
44					very stiff						
45	S&H		28								
46											
47				CL	CLAY with SAND (CL) olive-gray, stiff to very stiff, wet						
48											
49											
50	S&H		16								
51											
52											
53											
54											
55											
56											
57				CL-ML	SILTY CLAY (CL-ML) olive-gray, very stiff, wet, with interbedded clayey sand seams						
58											
59											
60	S&H		15								

PROJECT:	MILPITAS LIBRARY Milpitas, California	Log of Boring B-6

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
60	S&H		15	CL-ML	SILTY CLAY (CL-ML) (continued) LL = 27, PI = 5, see Appendix B Consolidated Undrained Triaxial Test, see Appendix B	TxCU	2,635	3,570		22.8	107
61											
62											
63											
64											
65											
66											
67											
68											
69											
70	S&H		20								
71											
72											
73											
74											
75											
76											
77				SP	SAND with GRAVEL (SP) gray, dense, wet, coarse sand, fine to coarse gravel						
78											
79											
80	S&H		43								
81											
82				CL	CLAY (CL) olive-gray, very stiff, wet						
83											
84											
85											
86											
87											
88											
89											
90	S&H		23								

PROJECT: **MILPITAS LIBRARY**
Milpitas, California

Log of Boring B-6

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		23		CLAY (CL) (continued)						
91											
92											
93											
94											
95				CL							
96											
97											
98											
99					very stiff to hard						
100	S&H		38								
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

Boring terminated at a depth of 100.5 feet
Boring backfilled with cement grout.
Groundwater obscured by drilling method.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.

Treadwell&Rollo

Project No.: 3918.01

Figure: A-6d

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > no. 200 sieve size)	Gravels (More than half of coarse fraction > no. 4 sieve size)	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils (more than half of soil < no. 200 sieve size)	Silts and Clays LL = < 50	ML	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	MH	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		PT	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes: U.S. Standard Sieve Size	Range of Grain Sizes: Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel	3" to No. 4	76.2 to 4.76
coarse	3" to 3/4"	76.2 to 19.1
fine	3/4" to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
coarse	No. 4 to No. 10	4.76 to 2.00
medium	No. 10 to No. 40	2.00 to 0.420
fine	No. 40 to No. 200	0.420 to 0.074
Silt and Clay	Below No. 200	Below 0.074

▽ Unstabilized groundwater level

▼ Stabilized groundwater level

SAMPLE DESIGNATIONS/SYMBOLS

- Sample taken with split-barrel sampler other than Standard Penetration Test sampler. Darkened area indicates soil recovered
- Classification sample taken with Standard Penetration Test sampler
- Undisturbed sample taken with thin-walled tube
- Disturbed sample
- Sampling attempted with no recovery
- Core sample
- Analytical laboratory sample
- Sample taken with Direct Push sampler

SAMPLER TYPE

C Core barrel

CA California split-barrel sampler with 2.5-inch outside diameter and a 1.93-inch inside diameter

D&M Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube

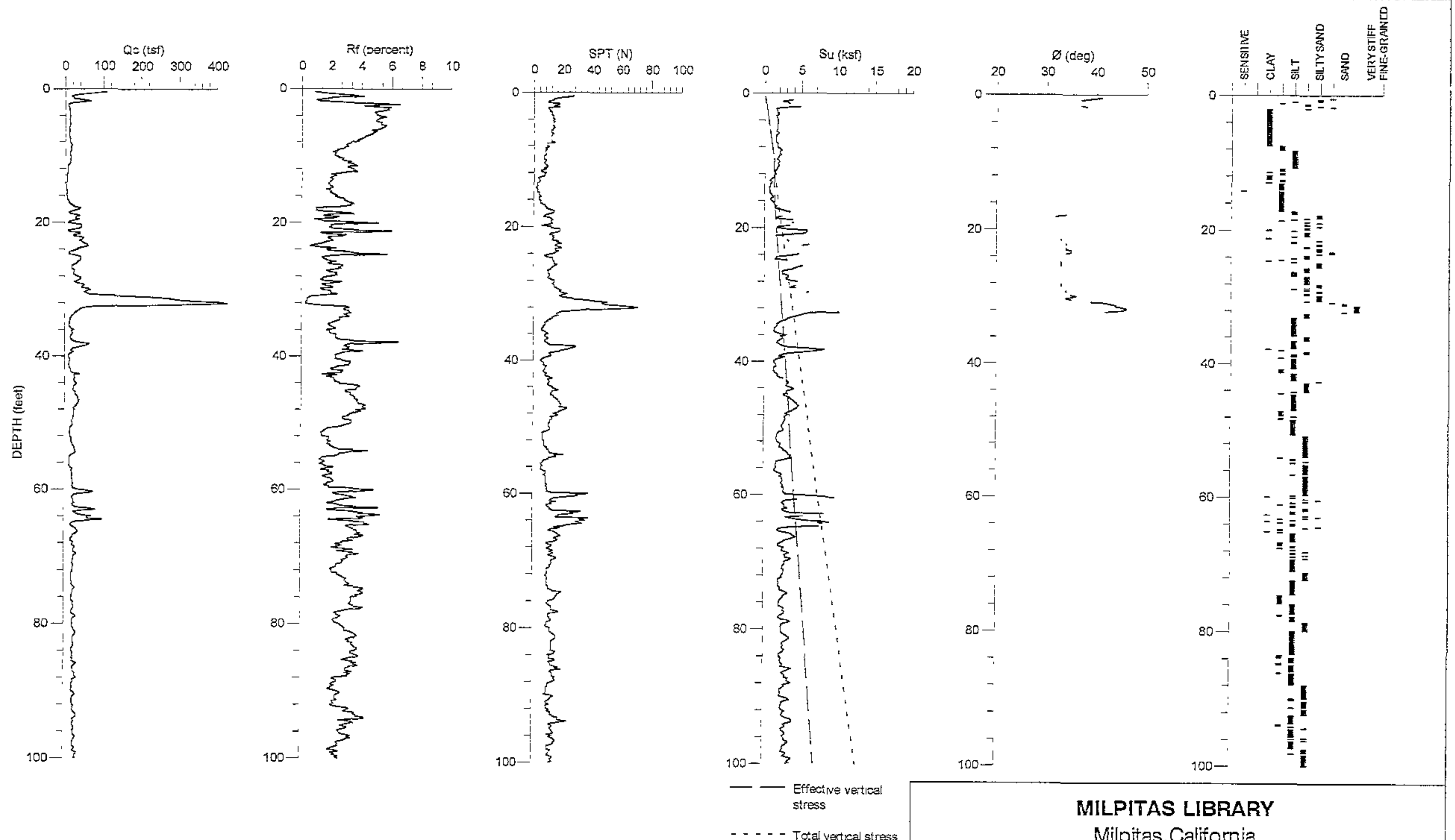
O Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube

PT Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube

S&H Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter

SPT Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter

ST Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure



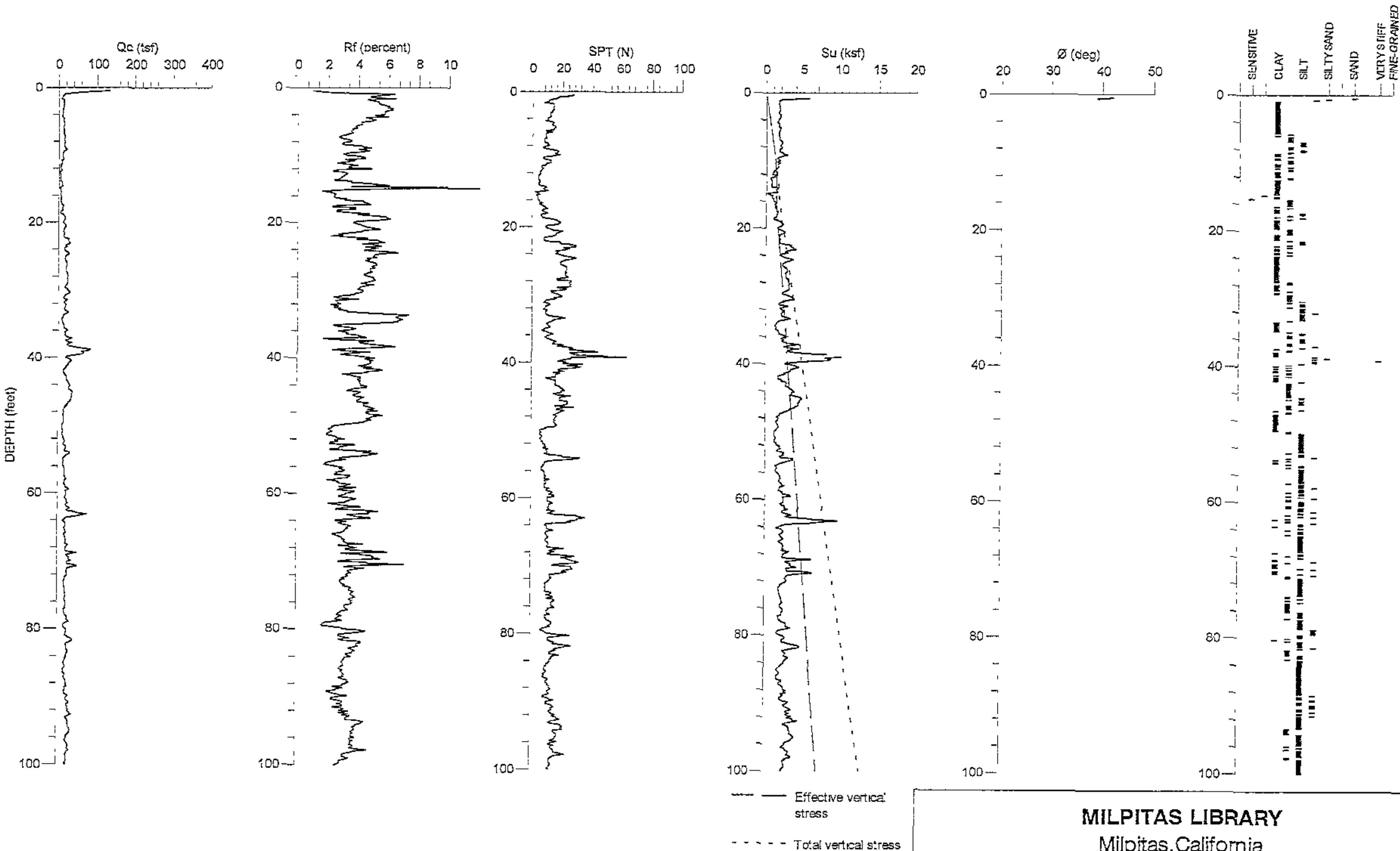
Terminated at 100 feet
Groundwater was measured at 9 feet.
Date performed: 05/25/04.

MILPITAS LIBRARY
Milpitas, California

CONE PENETRATION TEST RESULTS
CPT-1

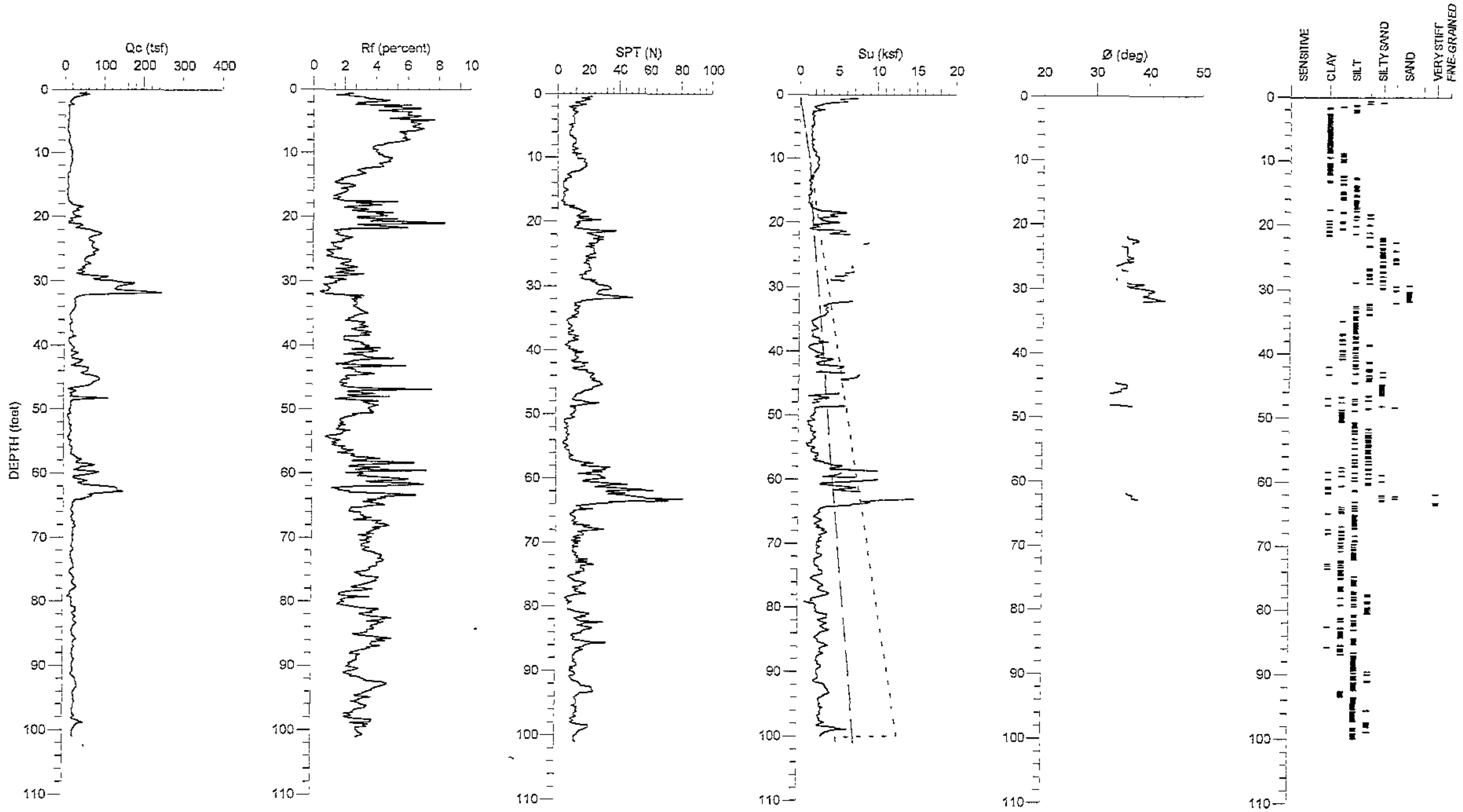
Date 05/27/04	Project No. 3918.01	Figure A-8

Treadwell&Rollo



Terminated at 100 feet
Groundwater was measured at 9.2 feet.
Date performed: 05/13/04.

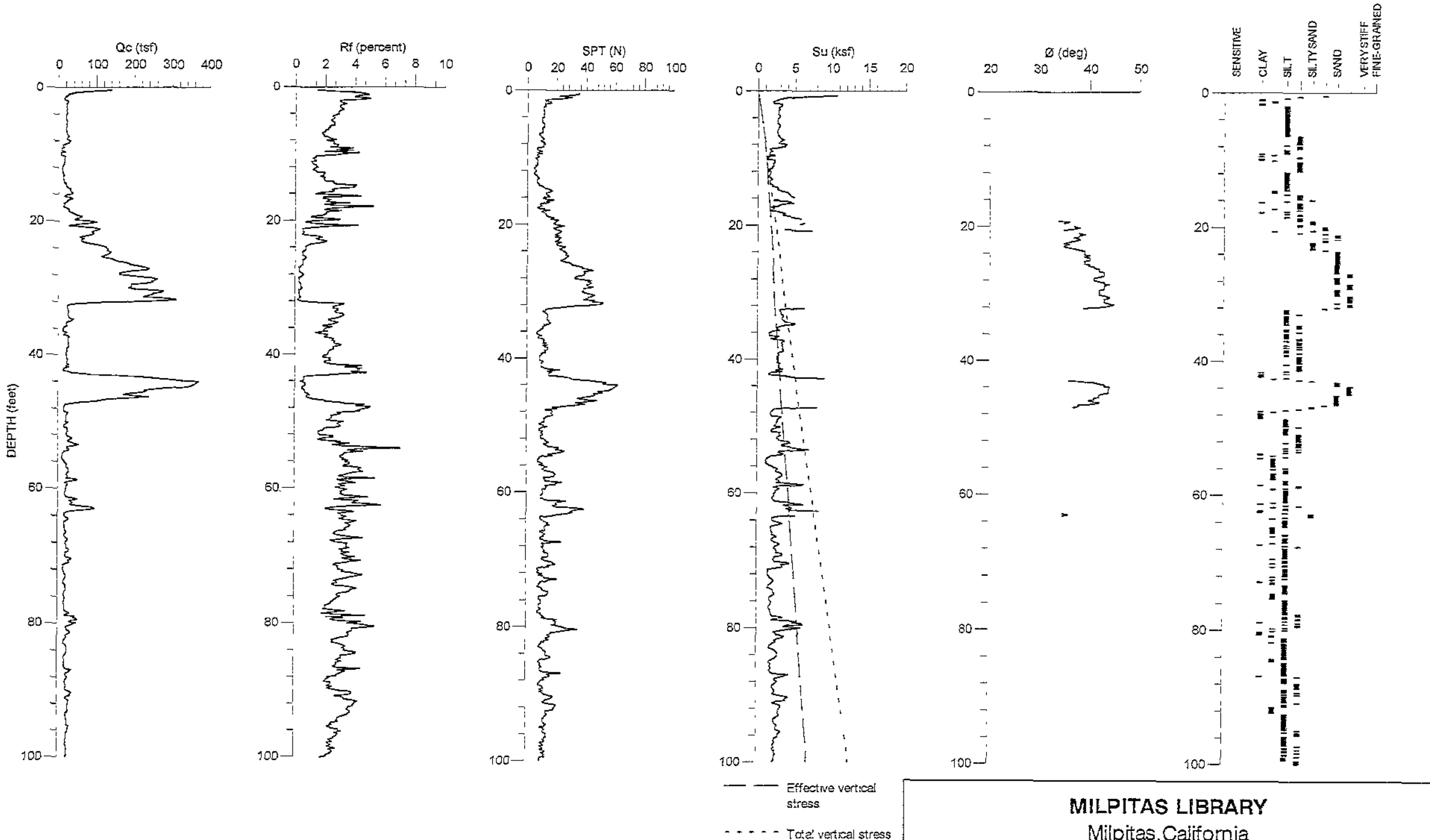
MILPITAS LIBRARY Milpitas, California		
CONE PENETRATION TEST RESULTS **CPT-2**		
Date 05/14/04	Project No. 3918.01	Figure A-9
Treadwell&Rollo		



Terminated at 100 feet
Groundwater was measured at 7 feet.
Date performed: 05/13/04.

MILPITAS LIBRARY Milpitas, California		
CONE PENETRATION TEST RESULTS CPT-3		
Date 05/14/04	Project No. 3918.01	Figure A-10

Treadwell&Rollo



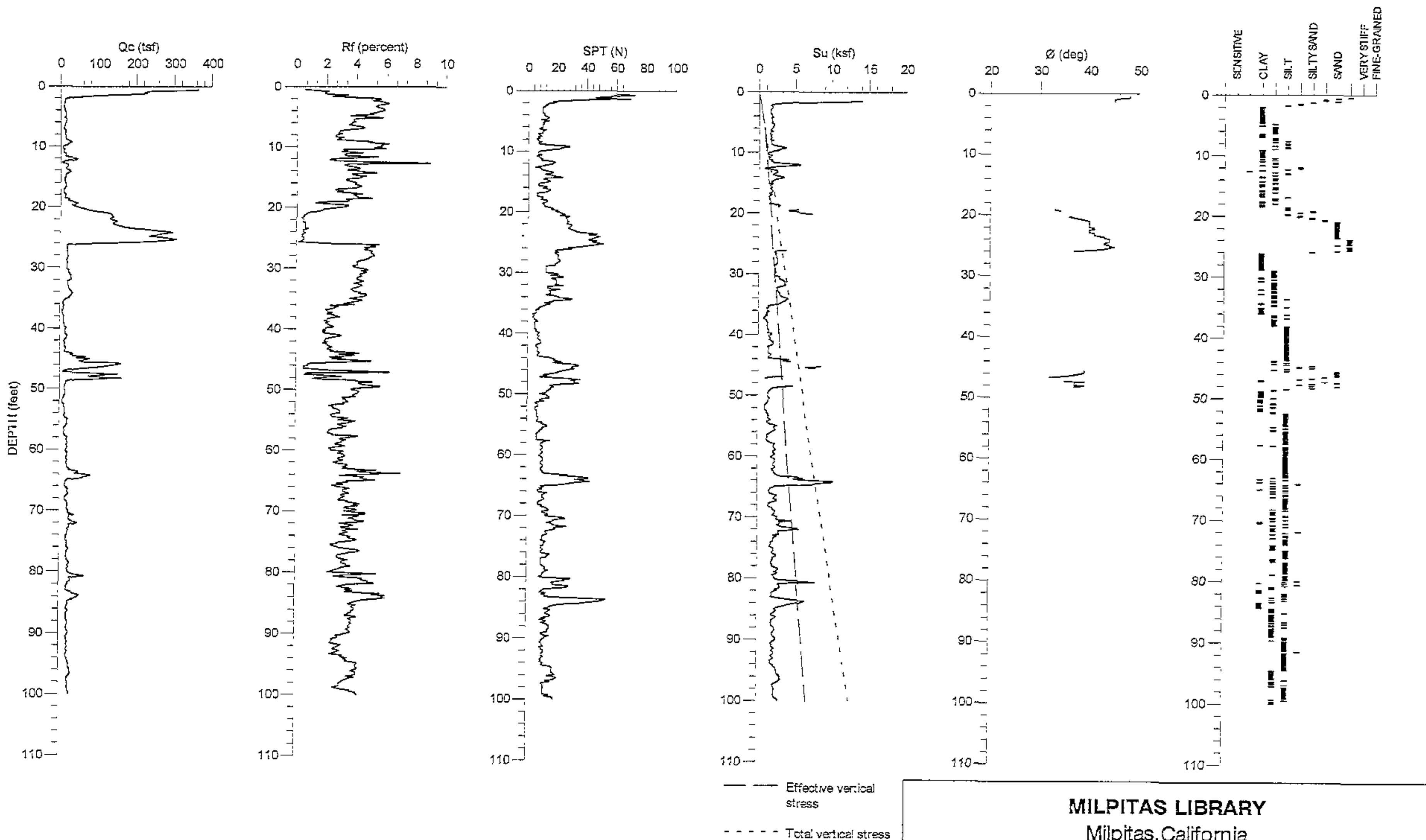
Terminated at 100 feet
Groundwater was measured at 9.7 feet.
Date performed: 05/25/04.

MILPITAS LIBRARY
Milpitas, California

CONE PENETRATION TEST RESULTS
CPT-4

Date 05/27/04	Project No. 3918.01	Figure A-11

Treadwell&Rollo



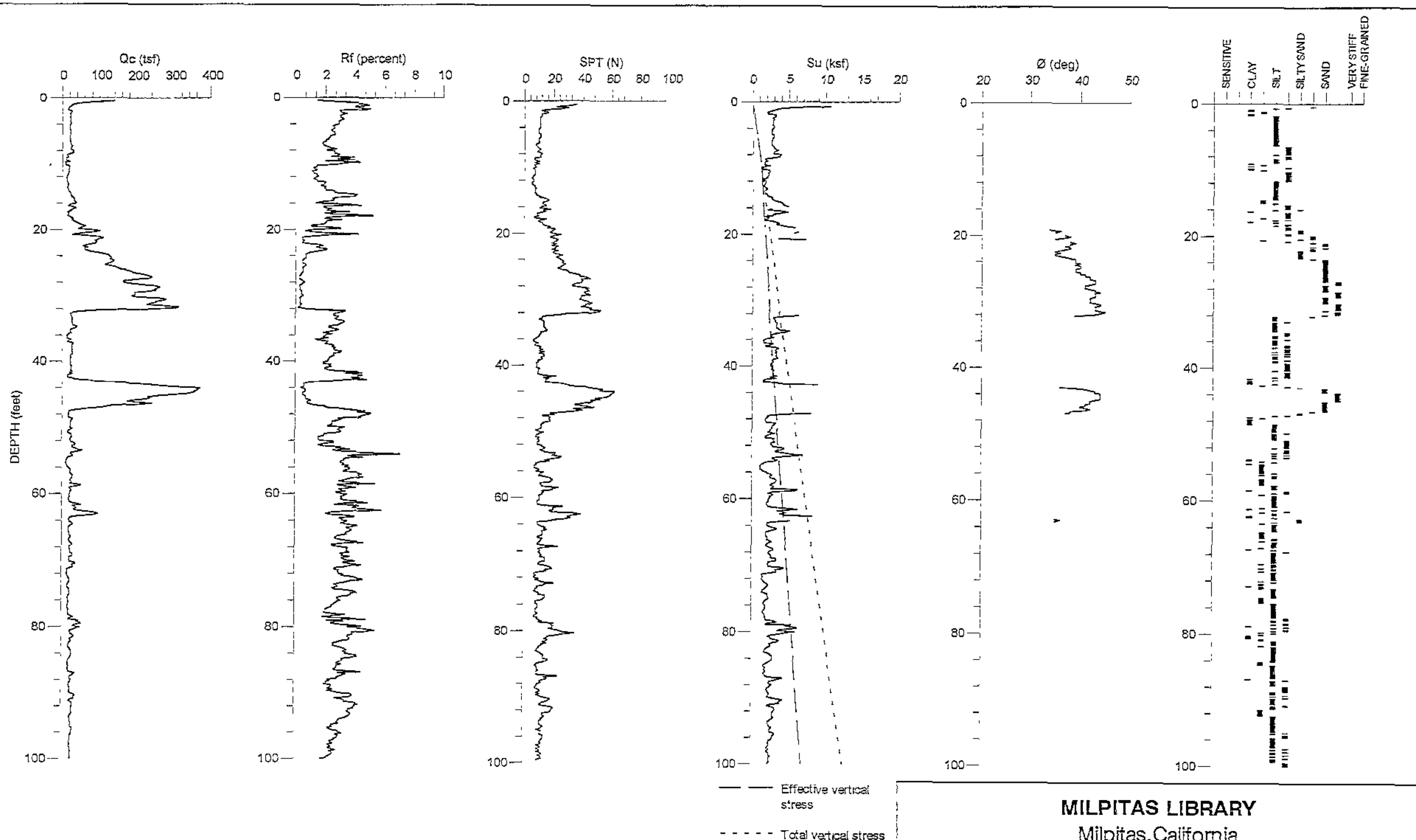
Terminated at 100 feet
Groundwater was measured at 7 feet.
Date performed: 05/13/04.

MILPITAS LIBRARY
Milpitas, California

CONE PENETRATION TEST RESULTS CPT-5

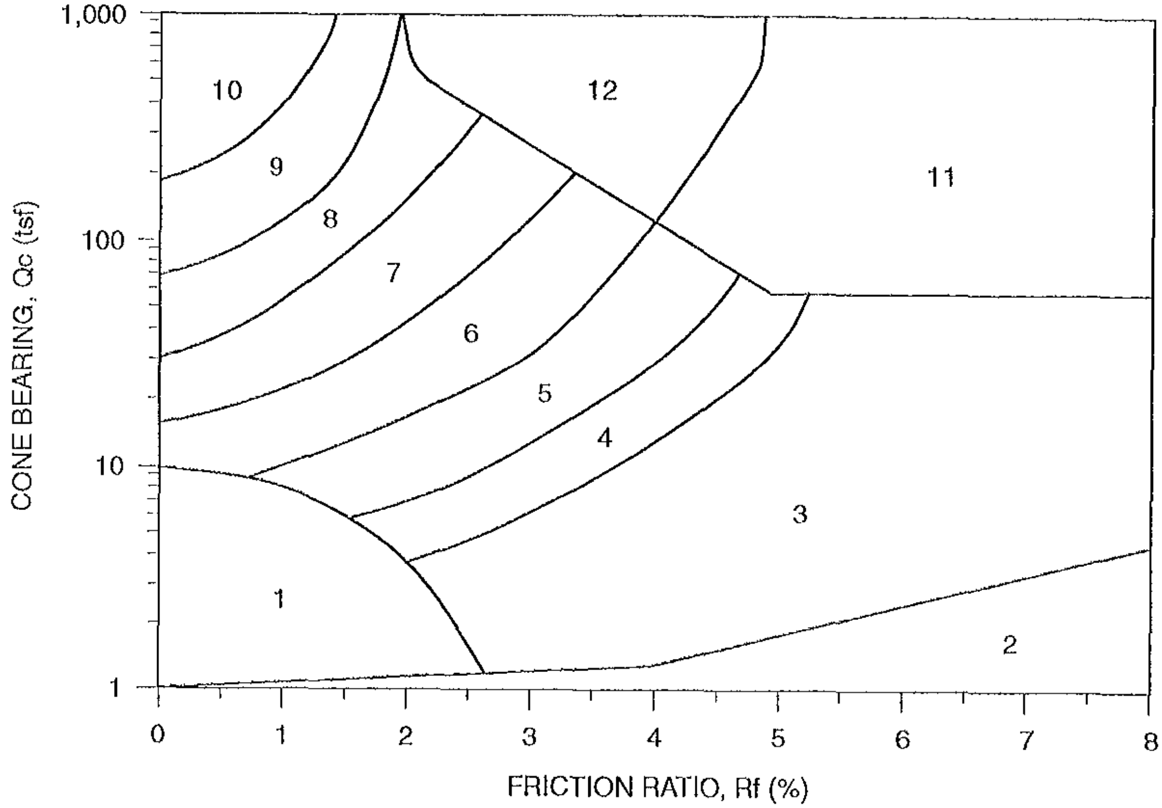
Date 05/14/04	Project No. 3918.01	Figure A-12

Treadwell&Rollo



Terminated at 100 feet
Groundwater was measured at 9.7 feet.
Date performed: 05/25/04.

MILPITAS LIBRARY Milpitas, California		
CONE PENETRATION TEST RESULTS **CPT-6**		
Date 05/27/04	Project No. 3918.01	Figure A-13
Treadwell&Rollo		



ZONE	Qc/N[1]	Su Factor (Nk)[2]	SOIL BEHAVIOR TYPE[1]
1	2	15 (10 for Qc 9 tsf)	Sensitive Fine-Grained
2	1	15 (10 for Qc 9 tsf)	Organic Material
3	1	15 (10 for Qc 9 tsf)	CLAY
4	1.5	15	SILTY CLAY to CLAY
5	2	15	CLAYEY SILT to SILTY CLAY
6	2.5	15	SANDY SILT to CLAYEY SILT
7	3	---	SILTY SAND to SANDY SILT
8	4	---	SAND to SILTY SAND
9	5	---	SAND
10	6	---	GRAVELLY SAND to SAND
11	1	15	Very Stiff Fine-Grained (*)
12	2	---	SAND to CLAYEY SAND (*)

(*) Overconsolidated or Cemented
Qc = Tip Bearing
Fs = Sleeve Friction
Rf = Fs/Qc x 100 = Friction Ratio

Note: Testing performed in accordance with ASTM D3441.

References: 1. Robertson, 1986, Olsen, 1988.
2. Bonaparte & Mitchell, 1979 (young Bay Mud Qc ≤9).
Estimated from local experience (fine-grained soils Qc > 9).

MILPITAS LIBRARY Milpitas, California	**CLASSIFICATION CHART FOR CONE PENETRATION TESTS**
Treadwell&Rollo	Date 07/07/04 | Project No. 3918.01 | Figure A-14

SARIMIENTO

APPENDIX B

Treadwell&Rollo

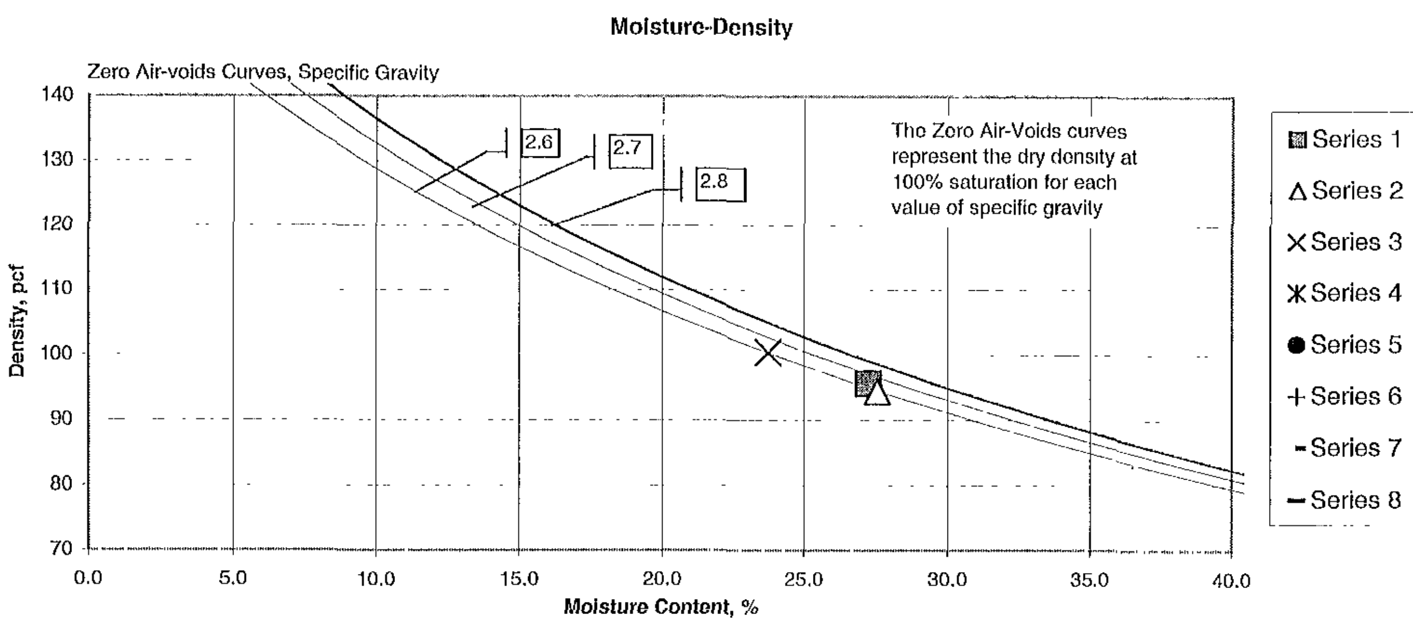
APPENDIX B
Laboratory Test Results

Moisture-Density-Porosity Report

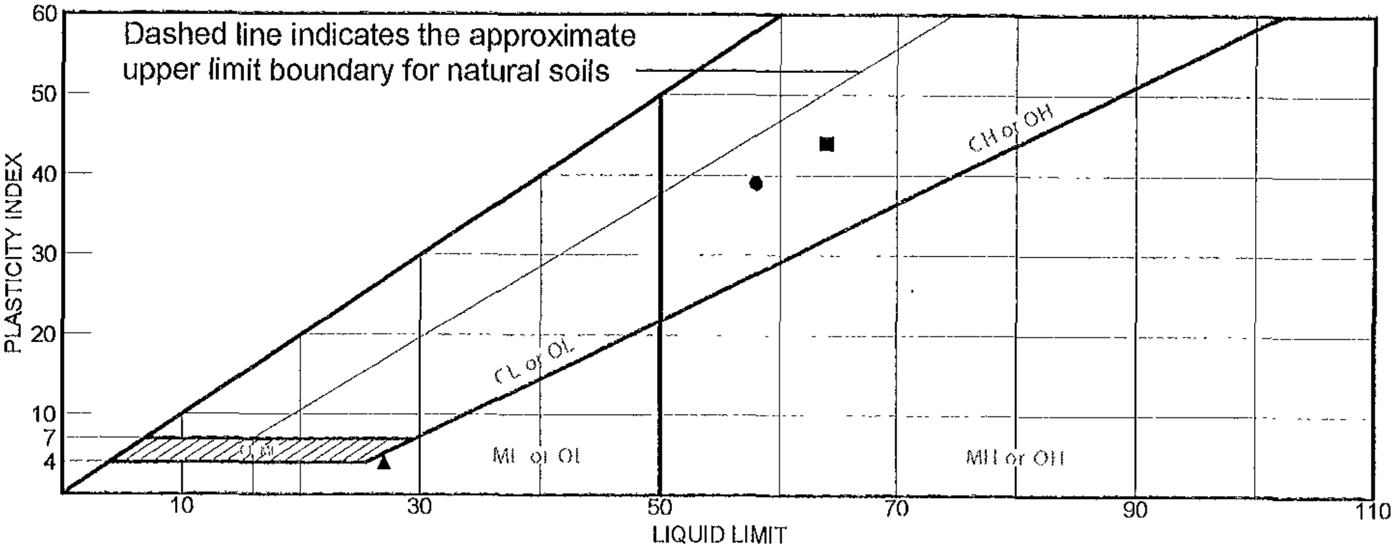
Cooper Testing Labs, Inc.

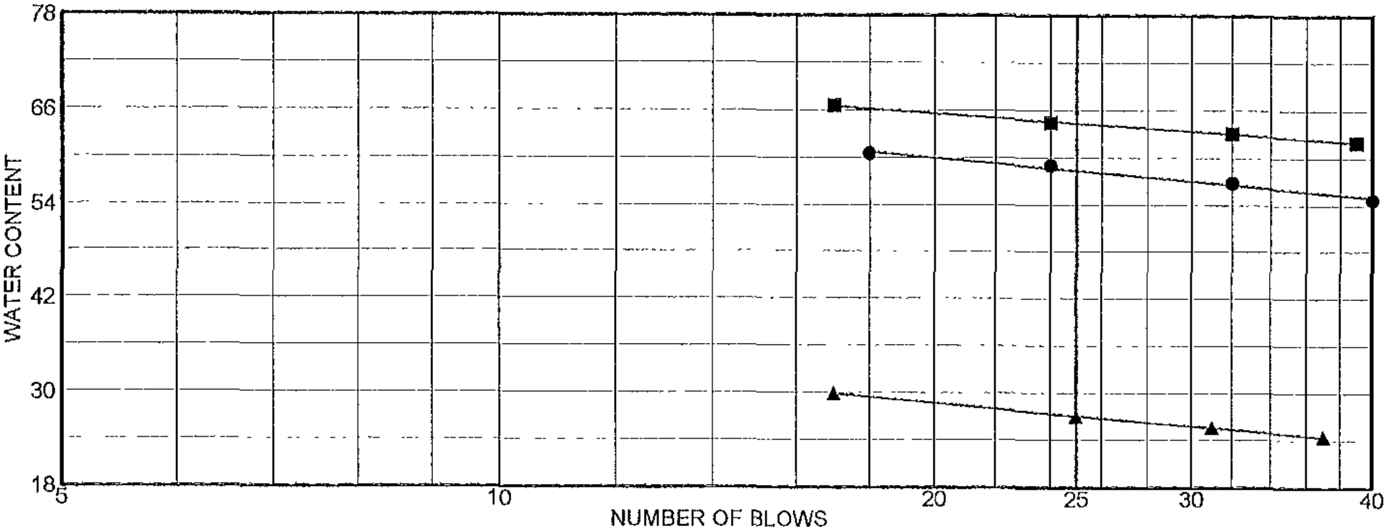
Job No:	010-831	**Date:**	06/04/04
Client:	Treadwell & Rollo	**By:**	MJ
Project:	Milpitas Library - 3918.01	**Remarks:**	

Boring:	B-1	B-2	B-4					
Sample:	1	1	1					
Depth, ft:	3	3	3					
Visual Description:	Dark Gray Fat CLAY	Dark Gray Fat CLAY	Dark Gray Fat CLAY					
Actual G_s								
Assumed G_s	2.70	2.70	2.70					
Total Vol cc	146.90	146.90	146.90					
Vol Solids,cc	83.26	82.19	87.41					
Vol Voids,cc	63.64	64.71	59.49					
Moisture, %	27.3	27.6	23.7					
Wet Unit wt, pcf	121.7	120.4	124.2					
Dry Unit wt, pcf	95.6	94.4	100.4					
Saturation, %	96.3	94.5	94.1					
Porosity, %	43.3	44.0	40.5					
Void Ratio	0.764	0.787	0.681					
Series	1	2	3	4	5	6	7	8



LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark gray Fat CLAY	58	19	39			
■	Dark gray Fat CLAY	64	20	44			
▲	Olive-brown SILT with SAND	27	23	4	100.0	76.6	ML
◆	Olive Silty SAND		24	NP	99.8	48.4	SM

Project No. 010-831 Client: Treadwell & Rollo

Project: Milpitas Library - 3918.01

Source	Sample No.	Elev./Depth
● Source: B-1	Sample No.: 1	Elev./Depth: 3'
■ Source: B-2	Sample No.: 1	Elev./Depth: 3'
▲ Source: B-3	Sample No.: 14	Elev./Depth: 59'
◆ Source: B-3	Sample No.: 15	Elev./Depth: 70'

Remarks:

●

■

▲

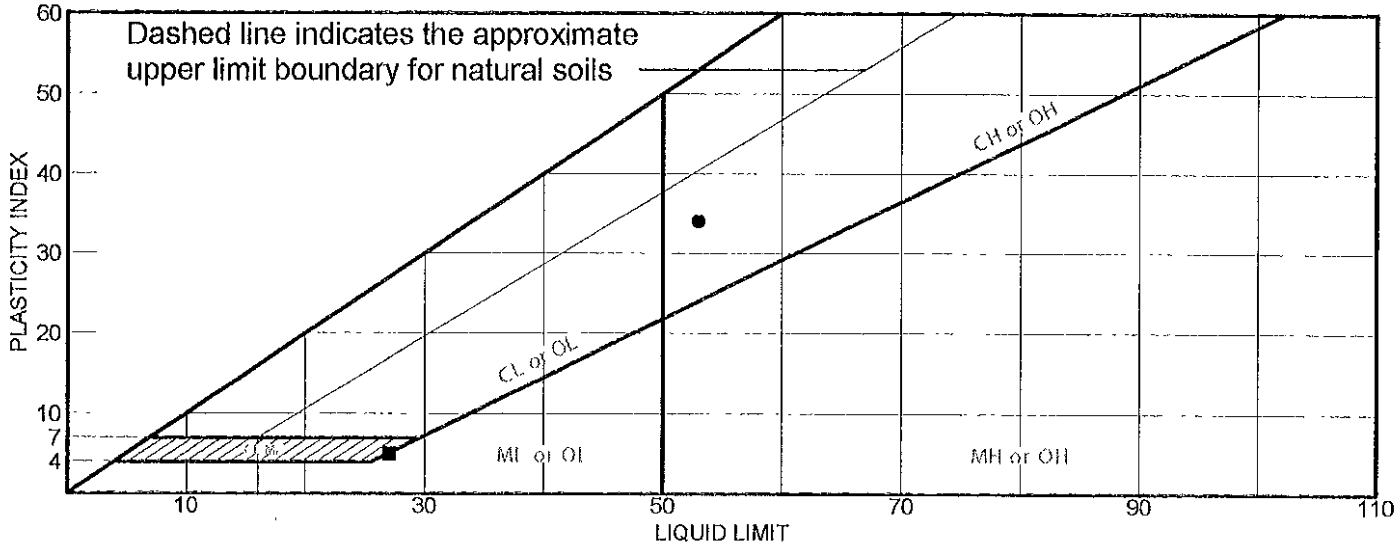
◆ Non-plastic: could not roll out and sample slides in the bowl.

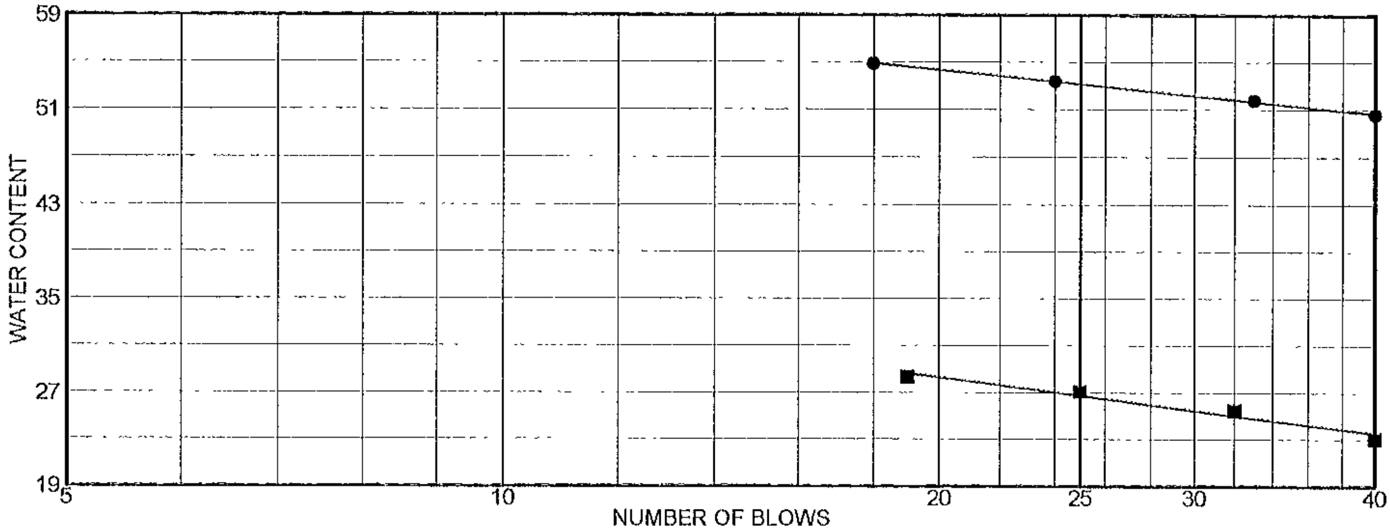
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark gray Fat CLAY	53	19	34			
■	Olive-gray Silty CLAY	27	22	5			

Project No. 010-831 Client: Treadwell & Rollo

Project: Milpitas Library - 3918.01

● Source: B-4 Sample No.: 1 Elev./Depth: 3'

■ Source: B-6 Sample No.: 14 Elev./Depth: 60'

Remarks:

●

■

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

#200 Sieve Wash Analysis
ASTM D 1140

COOPER TESTING LABORATORY

Job No.: 010-831 | Project No.: 3918.01 | Run By: MD
Client: Treadwell and Rollo | Date: 6/4/2004 | Checked By: DC
Project: Milpitas Library

Boring:	B-1	B-1	B-2	B-2	B-5	B-6		
Sample:	8	11	5	8	6	5		
Depth, ft.:	19	29	15	24	24	19		
Soil Type:	Olive-gray SAND with Silt	Olive-gray SAND with Gravel	Brown SAND with Silt	Gray Silty SAND	Brown Silty SAND	Brown Silty SAND		
Wt of Dish & Dry Soil, gm	545.8	553.3	436.5	404.0	517.3	556.8		
Weight of Dish, gm	179.4	121.5	180.5	156.2	165.0	178.5		
Weight of Dry Soil, gm	366.4	431.8	256.0	247.8	352.3	378.3		
Wt. Ret. on #4 Sieve, gm	1.6	111.2	0.0	2.1	1.4	0.0		
Wt. Ret. on #200 Sieve, gm	335.6	414.2	230.8	215.4	200.2	253.0		
% Gravel	**0.4**	**25.8**	**0.0**	**0.8**	**0.4**	**0.0**		
% Sand	**91.2**	**70.2**	**90.2**	**86.1**	**56.4**	**66.9**		
% Silt & Clay	**8.4**	**4.1**	**9.8**	**13.1**	**43.2**	**33.1**		

Remarks: As an added benefit to our clients, the gravel fraction may be included in this report. Whether or not it is included is dependent upon both the technician's time available and if there is a significant enough amount of gravel. The gravel is always included in the percent retained on the #200 sieve but may not be weighed separately to determine

Corrosivity Test Summary

COOPER TESTING LABORATORY

CTL # 010-831 Date: 6/4/2004 Tested By: PJ Checked: PJ

Client: Treadwell & Rollo Project: Milpitas Library Proj. No: 3918.01

Remarks:

Sample Location or ID			Resistivity @ 15.5 °C (Ohm-cm)			Chloride	Sulfate-(water soluble)		pH	ORP	Moisture	Soil Visual Description
Boring	Sample, No.	Depth, ft.	As Rec.	Minimum	Saturated	mg/kg	mg/kg	%		(Redox)	As Received	
						Dry Wt.	Dry Wt.	Dry Wt.		mv	%	
			ASTM G57	Cal 643	ASTM G57	Cal 422-mod.	Cal 417-mod.	Cal 417-mod.	ASTM G51	SM 2580B	ASTM D2216	
B-2	-	2.5	-	-	869	5	120	0.0120	7.4	259	25.2	Dark Gray CLAY
B-6	-	3	-	-	312	131	1,149	0.1149	7.7	240	24.9	Gray-brown CLAY

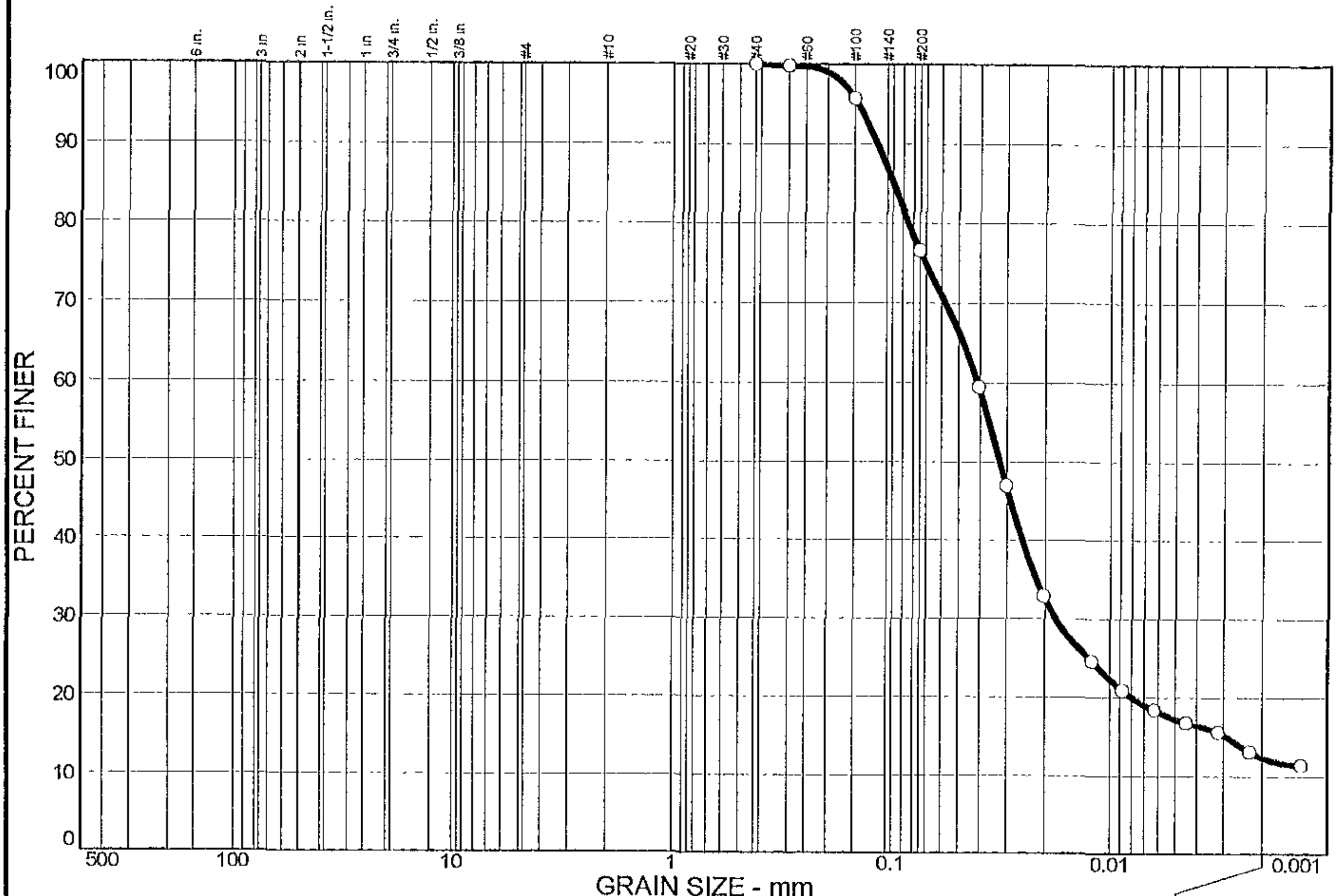
COOPER

Summary of Sieve Analysis Tests Data

CTL#: 010-831
Client: Treadell & Rollo
Project: 3918.0
By: DC
Date: 6/8/04
Remarks:

#	1	2	3	4	5	6	7	8	9	10	11	12
Boring:	3.0	3.0										
Sample:	14.0	15.0										
Depth:	59.0	70.0										
Sieve #	% Finer	% Finer	% Finer	% Finer	% Finer	% Finer	% Finer	% Finer	% Finer	% Finer	% Finer	% Finer
3.0"												
2.5"												
2.0'												
1.5"												
1.0"												
3/4"												
3/8"												
#4												
#10												
#30		100.0										
#40	100.0	99.8										
#50	99.8	98.3										
#100	95.7	80.6										
#200	76.6	48.4										
.04mm	59.5	25.6										
.03mm	47.0	20.9										
.02mm	32.9	16.2										
.01mm	24.6	13.1										
.009mm	20.9	11.1										
.006mm	18.4	9.6										
.005mm	16.8	8.8										
.003mm	15.6	7.5										
.002mm	13.1	6.1										
.001mm	11.4	5.3										

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.0	23.4	64.2	12.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#40	100.0		
#50	99.8		
#100	95.7		
#200	76.6		
0.0404 mm.	59.5		
0.0303 mm.	47.0		
0.0204 mm.	32.9		
0.0121 mm.	24.6		
0.0088 mm.	20.9		
0.0063 mm.	18.4		
0.0045 mm.	16.8		
0.0032 mm.	15.6		
0.0023 mm.	13.1		
0.0013 mm.	11.4		

* (no specification provided)

Soil Description

Olive-brown SILT with SAND

Atterberg Limits

PL= 23 LL= 27 PI= 4

Coefficients

D_{85}= 0.0996 D_{60}= 0.0410 D_{50}= 0.0325
D_{30}= 0.0179 D_{15}= 0.0029 D_{10}=
C_u= C_c=

Classification

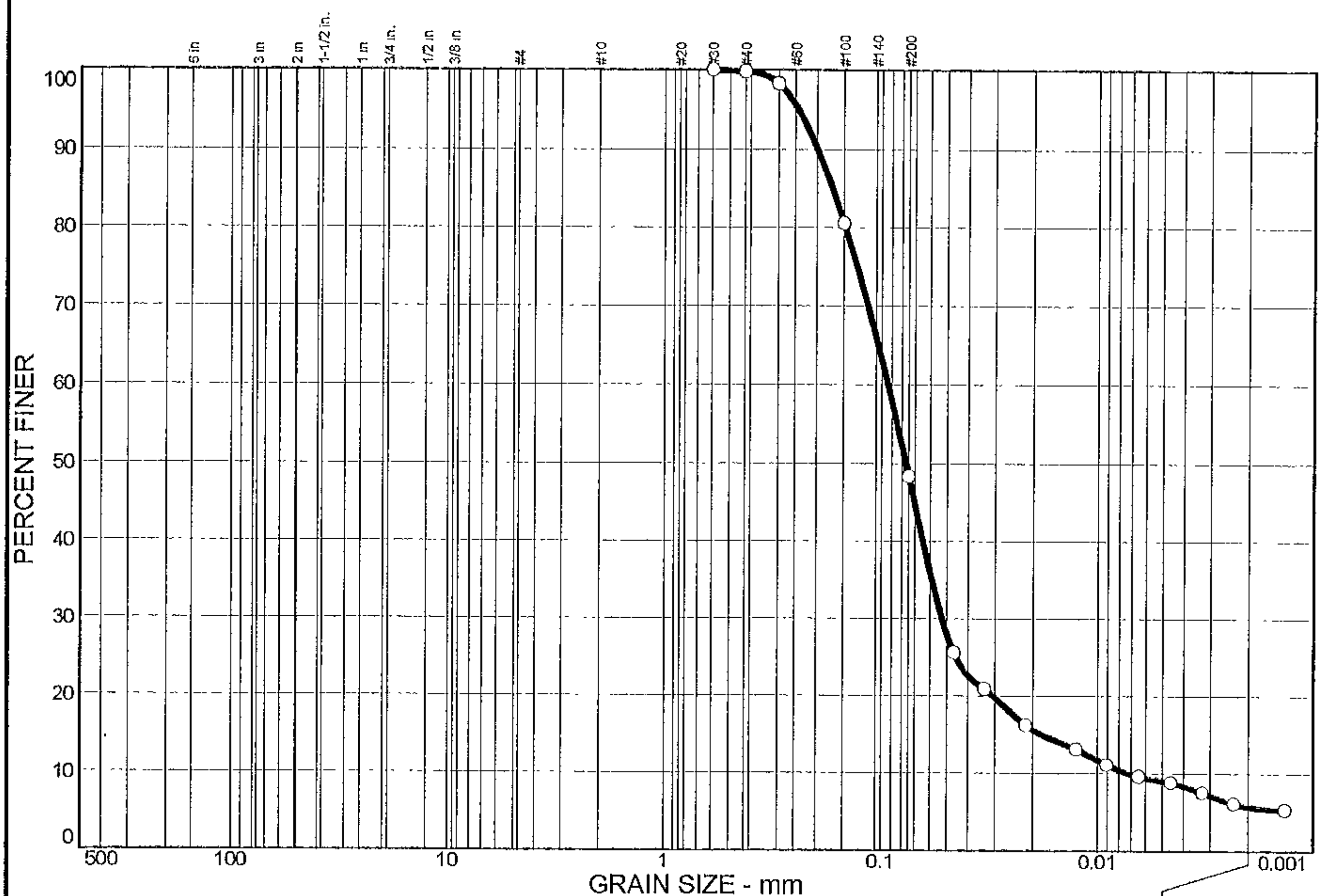
USCS= ML AASHTO=

Remarks

Sample No.: 14 Source of Sample: B-3 Date: 6/4/04
Location: Elev./Depth: 59'

COOPER TESTING LABORATORY	Client: Treadwell & Rollo Project: Milpitas Library - 3918.01 Project No: 010-831 Figure

PARTICLE SIZE DISTRIBUTION TEST REPORT



% +3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.2	51.4	42.7	5.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#30	100.0		
#40	99.8		
#50	98.3		
#100	80.6		
#200	48.4		
0.0466 mm.	25.6		
0.0336 mm.	20.9		
0.0216 mm.	16.2		
0.0126 mm.	13.1		
0.0091 mm.	11.1		
0.0065 mm.	9.6		
0.0046 mm.	8.8		
0.0033 mm.	7.5		
0.0023 mm.	6.1		
0.0014 mm.	5.3		

* (no specification provided)

Soil Description

Olive Silty SAND

Atterberg Limits

PL= 24 LL= PI= NP

Coefficients

D_{85}= 0.170 D_{60}= 0.0936 D_{50}= 0.0772
D_{30}= 0.0527 D_{15}= 0.0184 D_{10}= 0.0073
C_u= 12.89 C_c= 4.09

Classification

USCS= SM AASHTO=

Remarks

Sample No.: 15 Source of Sample: B-3 Date: 6/4/04
Location: Elev./Depth: 70'

COOPER TESTING LABORATORY

Client: Treadwell & Rollo
Project: Milpitas Library - 3918.01

Project No: 010-831 Figure

R-value Test Report (Caltrans 301)

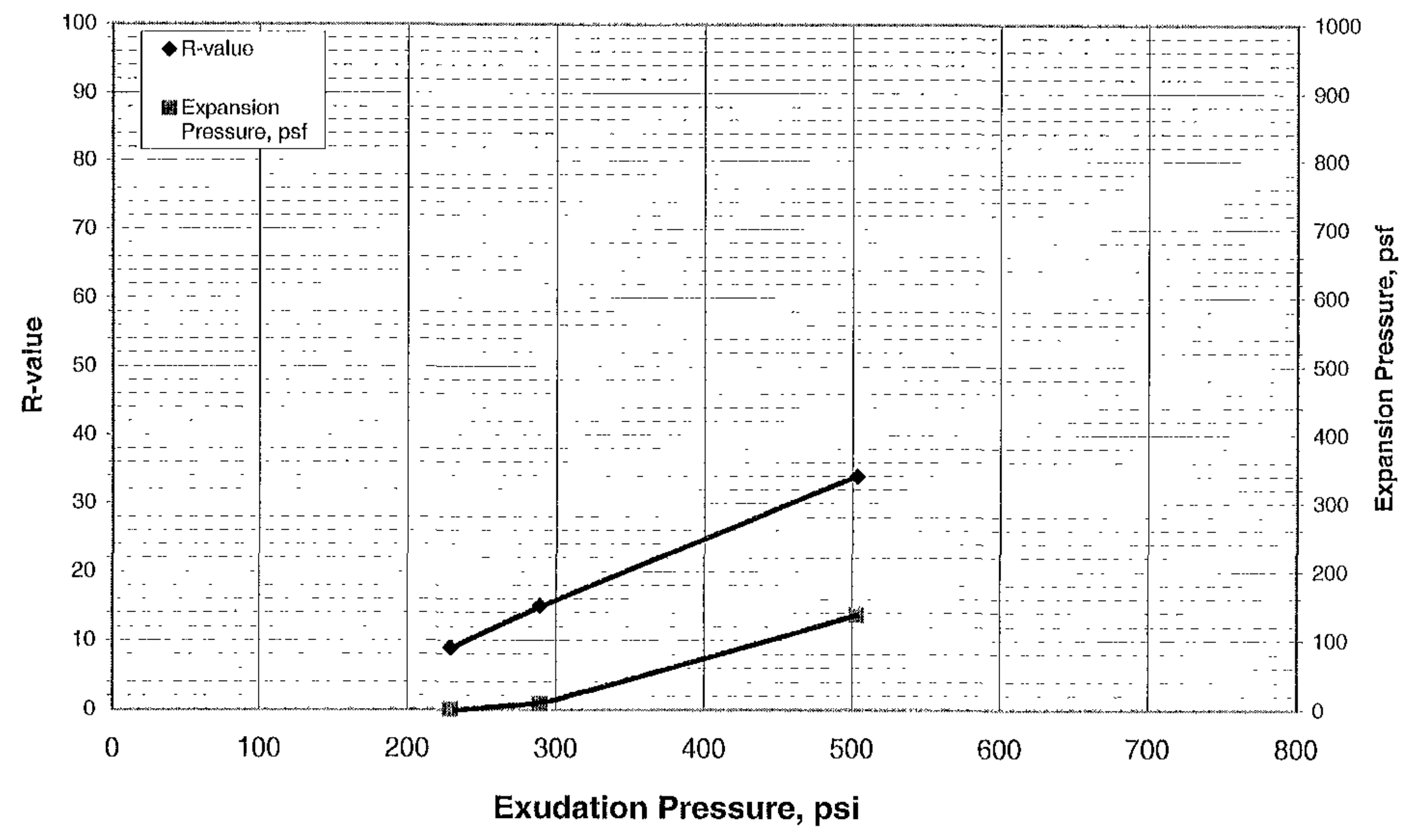
COOPER TESTING LABORATORY

Job No.:	010-831a	**Date:**	05/24/04
Client:	Treadwell & Rollo	**Tested**	MD
Project:	Milpitas Library - 3918.01	**Reduced**	MJ
Sample	B-1, Bulk @ 0.5-3'	**Checked**	DC
Soil Type:	Dark-gray Clayey SAND, trace Gravel		

Initial Moisture,	10.7%
R-value	**16**
Expansion Pressure	**20** psf

Remarks:

Specimen Number	A	B	C	D
Exudation Pressure, psi	289	229	503	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	40	60	20	
Weight of Soil & Mold, grams	3226	3176	3178	
Weight of Mold, grams	2108	2096	2075	
Height After Compaction, in.	2.53	2.45	2.45	
Moisture Content, %	14.4	16.3	12.6	
Dry Density, pcf	116.9	114.8	121.1	
Expansion Pressure, psf	8.6	0.0	137.6	
Stabilometer @ 1000				
Stabilometer @ 2000	130	141	101	
Turns Displacement	3.38	3.6	2.87	
R-value	15	9	34	



R-value Test Report (Caltrans 301)

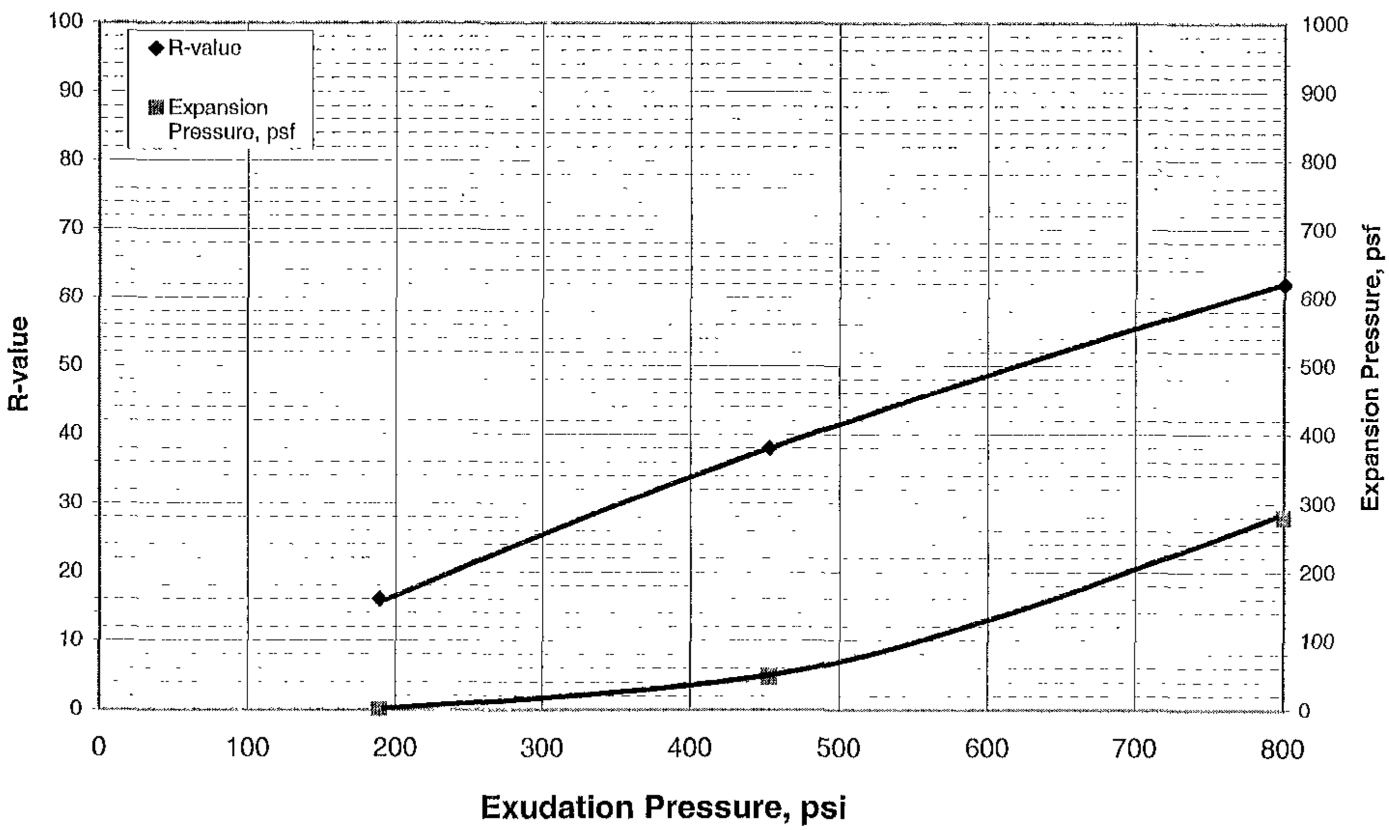
COOPER TESTING LABORATORY

Job No.:	010-831b	Date:	05/21/04
Client:	Treadwell & Rollo	Tested	MD
Project:	Milpitas Library - 3918.01	Reduced	MJ
Sample	B-3, Bulk @ 0.5 - 2.5'	Checked	DC
Soil Type:	Brown Clayey SAND, trace Gravel		

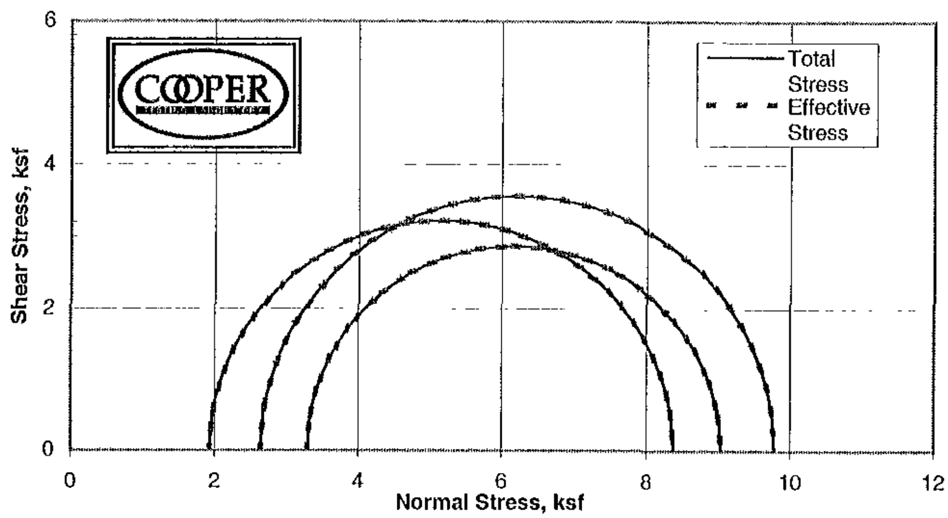
Initial Moisture,	10.3%
R-value	26
Expansion Pressure	20 psf

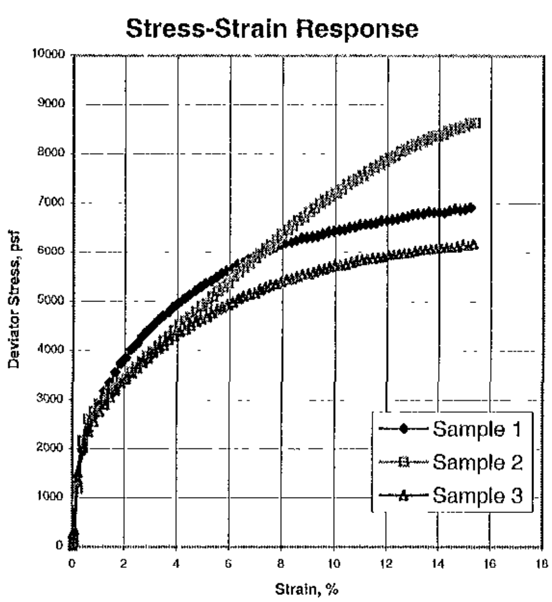
Specimen Number	A	B	C	D
Exudation Pressure, psi	189	453	800	
Prepared Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	40	20	0	
Weight of Soil & Mold, grams	3260	3210	3217	
Weight of Mold, grams	2095	2075	2070	
Height After Compaction, in.	2.58	2.47	2.45	
Moisture Content, %	14.0	12.2	10.3	
Dry Density, pcf	119.9	124.0	128.5	
Expansion Pressure, psf	0.0	47.3	279.5	
Stabilometer @ 1000				
Stabilometer @ 2000	128	91	54	
Turns Displacement	3.62	3.1	2.95	
R-value	16	38	62	

Remarks:



Triaxial Consolidated Undrained





Sample:	1	2	3	4
MC, %	19.0	24.8	21.9	
DD, pcf	112.9	103.6	109.5	
Sat. %	97.3	101.2	102.7	
Void Ratio	0.547	0.687	0.596	
Diameter in	2.41	2.41	2.41	
Height, in	5.00	5.00	5.00	
	Final			
MC, %	19.9	22.8	22.2	
DD, pcf	112.1	106.6	107.7	
Sat. %	100.0	100.0	100.0	
Void Ratio	0.558	0.639	0.623	
Diameter, in	2.42	2.39	2.44	
Height, in	4.99	4.93	4.94	
Cell, psi	62.3	66.6	72.1	
BP, psi	48.9	48.3	49.3	
	Effective Stresses At:			
Strain, %	10.0	10.0	10.0	
Deviator ksf	6.447	7.142	5.749	
Excess PP	0.000	0.000	0.000	
Sigma 1	8.376	9.778	9.032	
Sigma 3	1.930	2.635	3.283	
P, ksf	5.153	6.206	6.158	
Q, ksf	3.223	3.571	2.875	
Stress Ratio	4.341	3.710	2.751	
Rate in/min	0.002	0.002	0.002	

Job No.: 010-831 **Date:** 38037

Client: Treadwell & Rollo BY:DC

Project: 3918.01

Sample 1) B1-13 @ 45' Olive CLAY

Sample 2) B6-14 @ 60' Olive-gray Silty CLAY

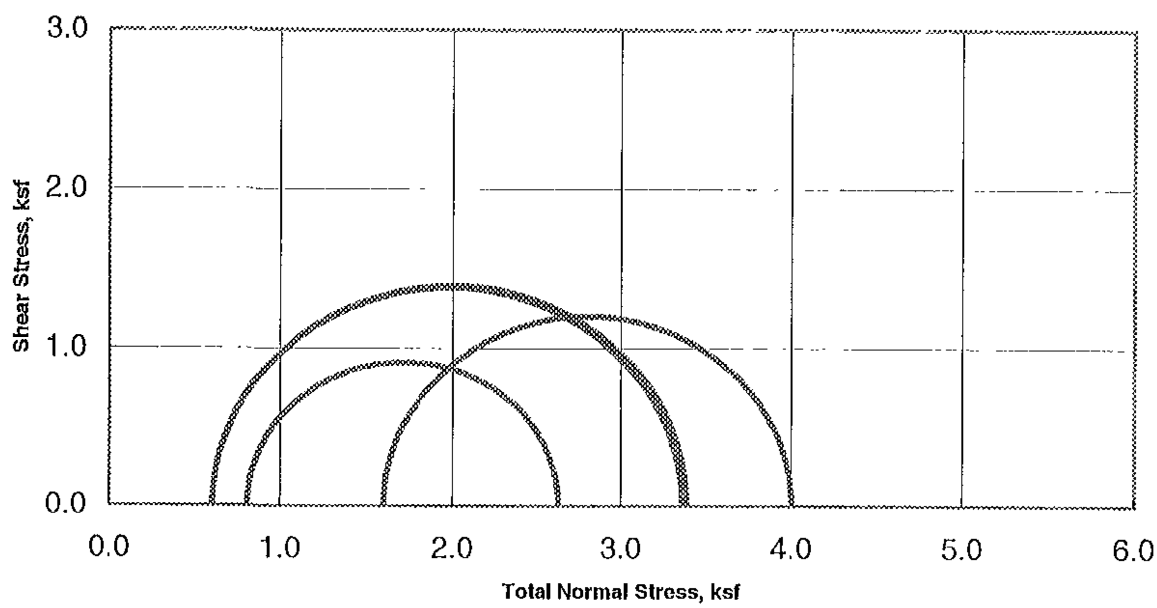
Sample 3) B5-14 @ 80' Olive-brown CLAY

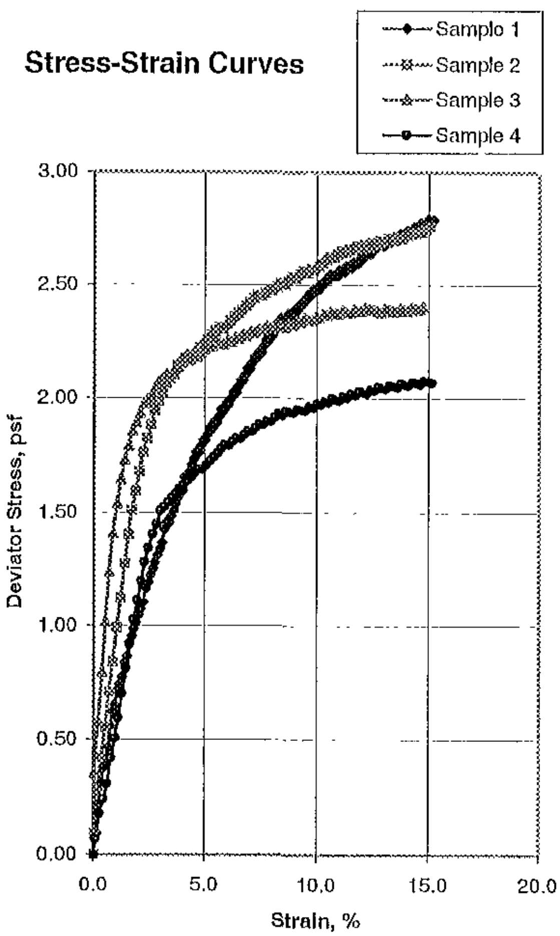
Sample 4)

Remarks: Values picked at 10% strain.

Unconsolidated-Undrained Triaxial Test

ASTM D-2850





Sample Data	1	2	3	4
Moisture %	18.7	20.9	24.5	28.6
Density pcf	113.1	107.3	101.0	95.9
Void Ratio	0.519	0.601	0 699	0.790
Saturation %	99.4	95.8	96.2	99.6
Height in	5.00	6.00	6.00	6.00
Diameter in	2.42	2.87	2.87	2.88
Cell psi	4 2	4.2	11.1	5.6
Strain %	14.90	15.10	12.40	14.80
Deviator, ksf	2.798	2.760	2.405	2.078
Rate %/min	1.00	1.00	1.00	1.00
in/min	0.050	0.060	0.060	0.060
Job No.:	010-831a			
Client:	Treadwell & Rollo			
Project:	Milpitas Library - 3918.01			
Boring:	B-1	B-2	B-3	B-4
Sample:	4	4	10	6
Depth ft:	10	9	34	14

Visual Soil Description

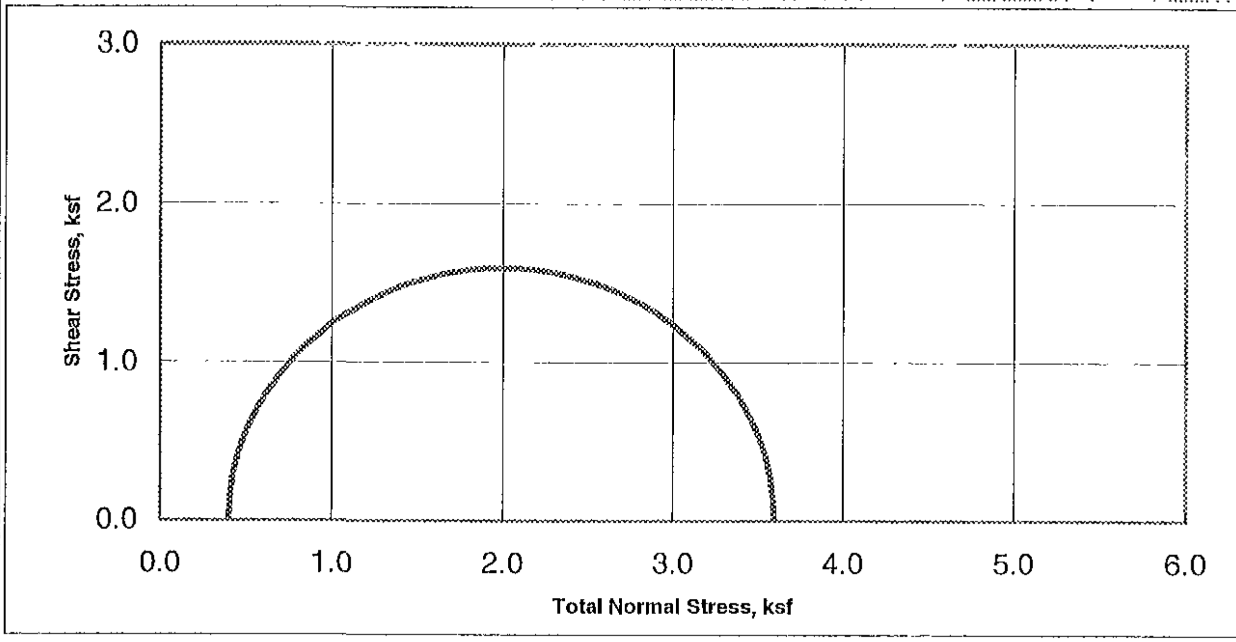
Sample #	
1	Olive CLAY with Sand
2	Olive-gray Sandy CLAY (silty), trace Gravel
3	Olive-brown Sandy CLAY (silty)
4	Olive-brown CLAY

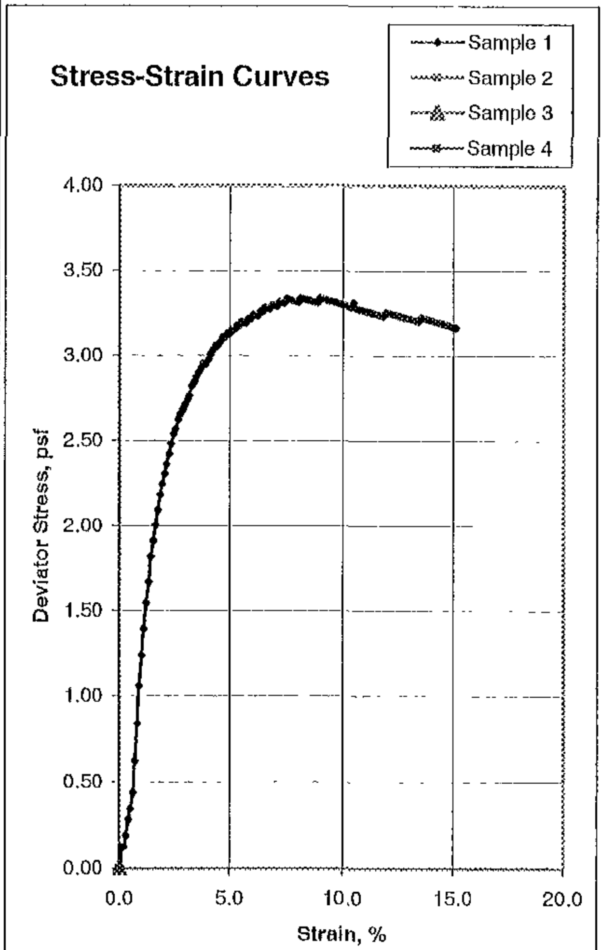
Remarks:

COOPER

Unconsolidated-Undrained Triaxial Test

ASTM D-2850





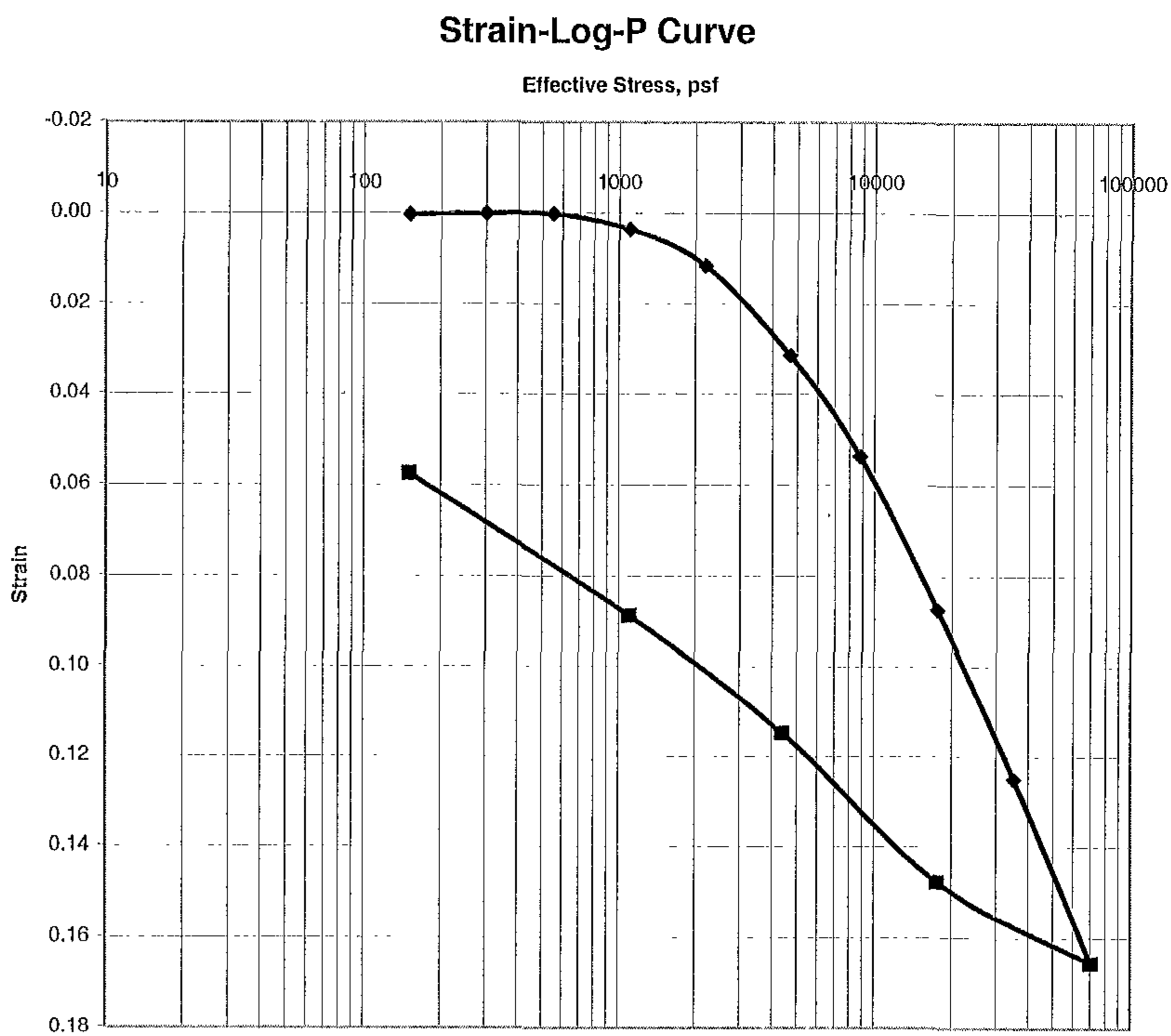
Sample Data				
	1	2	3	4
Moisture %	29.9			
Density pcf	93.7			
Void Ratio	0.831			
Saturation %	98.8			
Height in	5.00			
Diameter in	2.42			
Cell psi	2.8			
Strain %	8.10			
Deviator, ksf	3.339			
Rate %/min	1.00			
in/min	0.050			
Job No.:	010-831b			
Client:	Treadwell & Rollo			
Project:	Milpitas Library - 3918.01			
Boring:	B-6			
Sample:	2			
Depth ft:	5			

Visual Soil Description	
Sample #	
1	Gray-brown CLAY
2	
3	
4	

Remarks:

Consolidation Test
ASTM D2435

Job No.:	010-831a	**Boring:**	1	**Run By:**	MD
Client:	Treadwell & Rollo	**Sample:**	3	**Reduced:**	DC
Project:	3918.01	**Depth':**	6'	**Checked:**	DC
Soil Type:	Olive CLAY w/Sand			**Date:**	6/7/2004



Ass. Gs = 2.7	Initial	Final
Moisture %:	25.1	24.4
Density, pcf:	99.7	101.7
Void Ratio:	0.691	0.657
% Saturation:	98.2	100

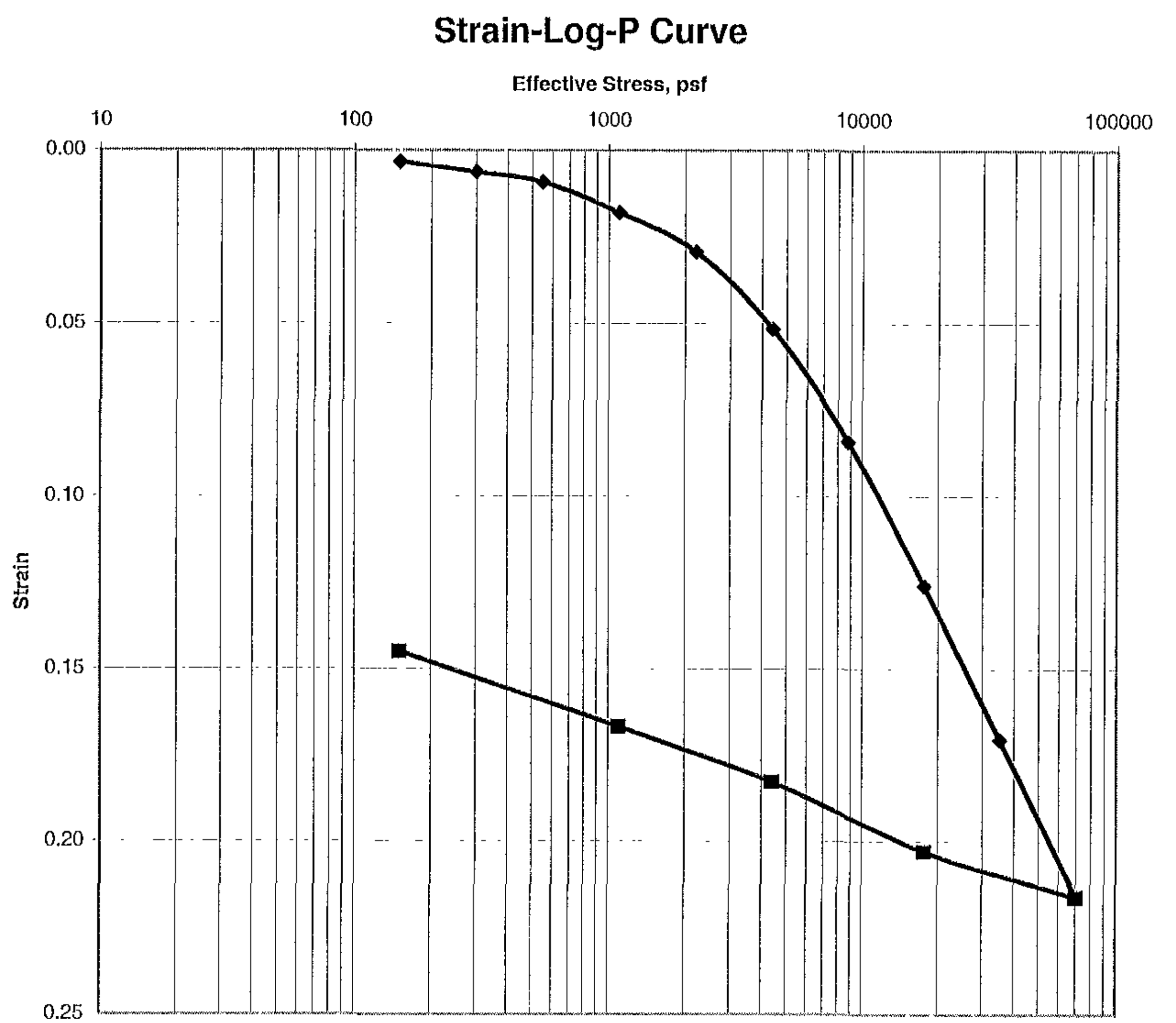
Remarks:

Consolidation Test

ASTM D2435

COOPER TESTING LABORATORY

Job No.:	010-831	Boring:	4	Run By:	MD
Client:	Treadwell & Rollo	Sample:	6	Reduced:	DC
Project:	3918.01	Depth':	14'	Checked:	DC
Soil Type:	Olive-brown CLAY			Date:	6/7/2004



Ass. Gs = 2.7	Initial	Final
Moisture %:	30.6	24.4
Density, pcf:	89.9	101.7
Void Ratio:	0.876	0.658
% Saturation:	94.3	100

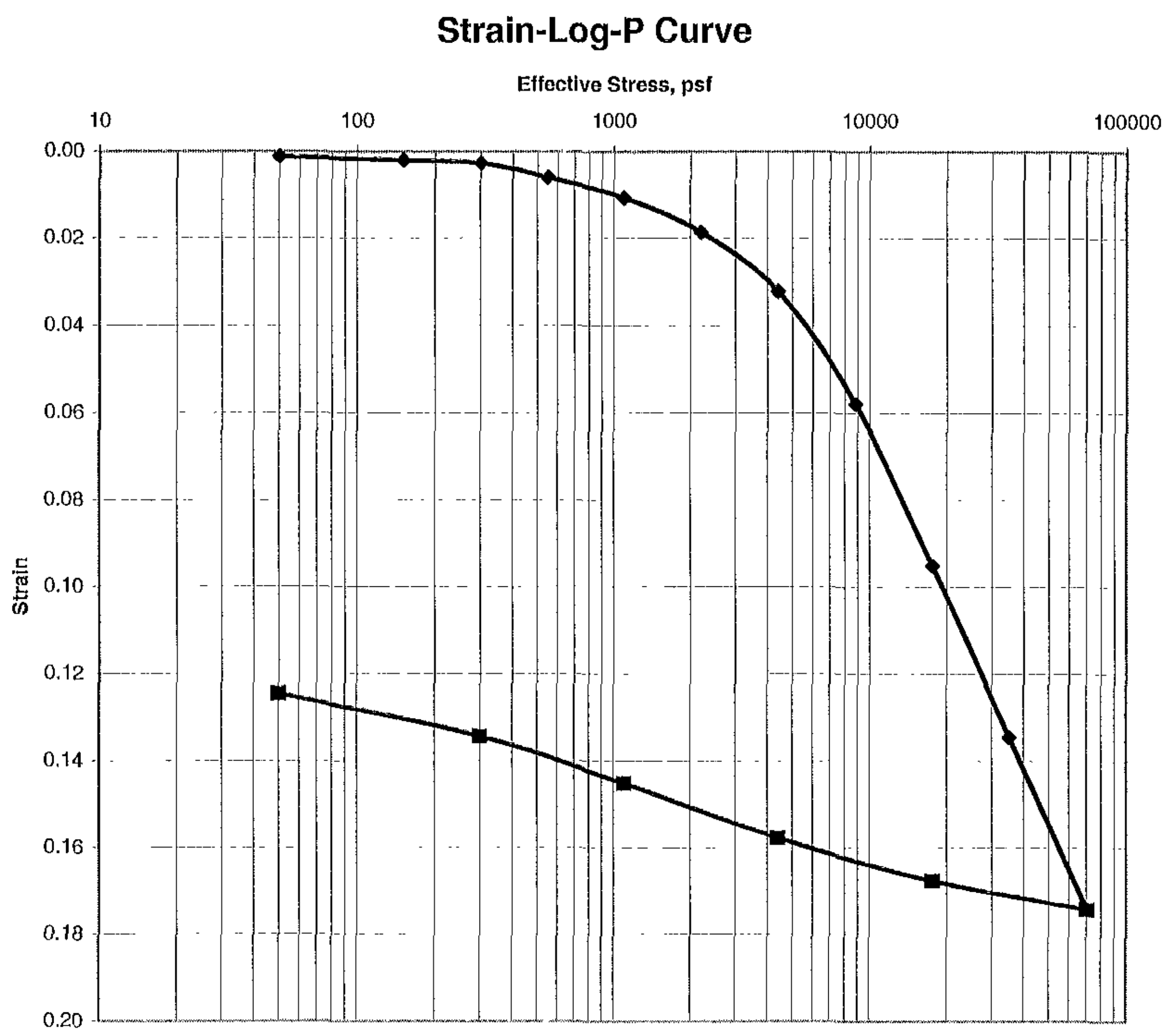
Remarks:

Consolidation Test

ASTM D2435

COOPER TESTING LABORATORY

Job No.:	010-831	**Boring:**	3	**Run By:**	MD
Client:	Treadwell & Rollo	**Sample:**	10	**Reduced:**	DC
Project:	3918.01	**Depth':**	34'	**Checked:**	DC
Soil Type:	Olive-brown Sandy CLAY			**Date:**	6/7/2004



Ass. Gs = 2.7	Initial	Final
Moisture %:	24.5	19.0
Density, pcf:	98.7	111.4
Void Ratio:	0.707	0.513
% Saturation:	93.5	100

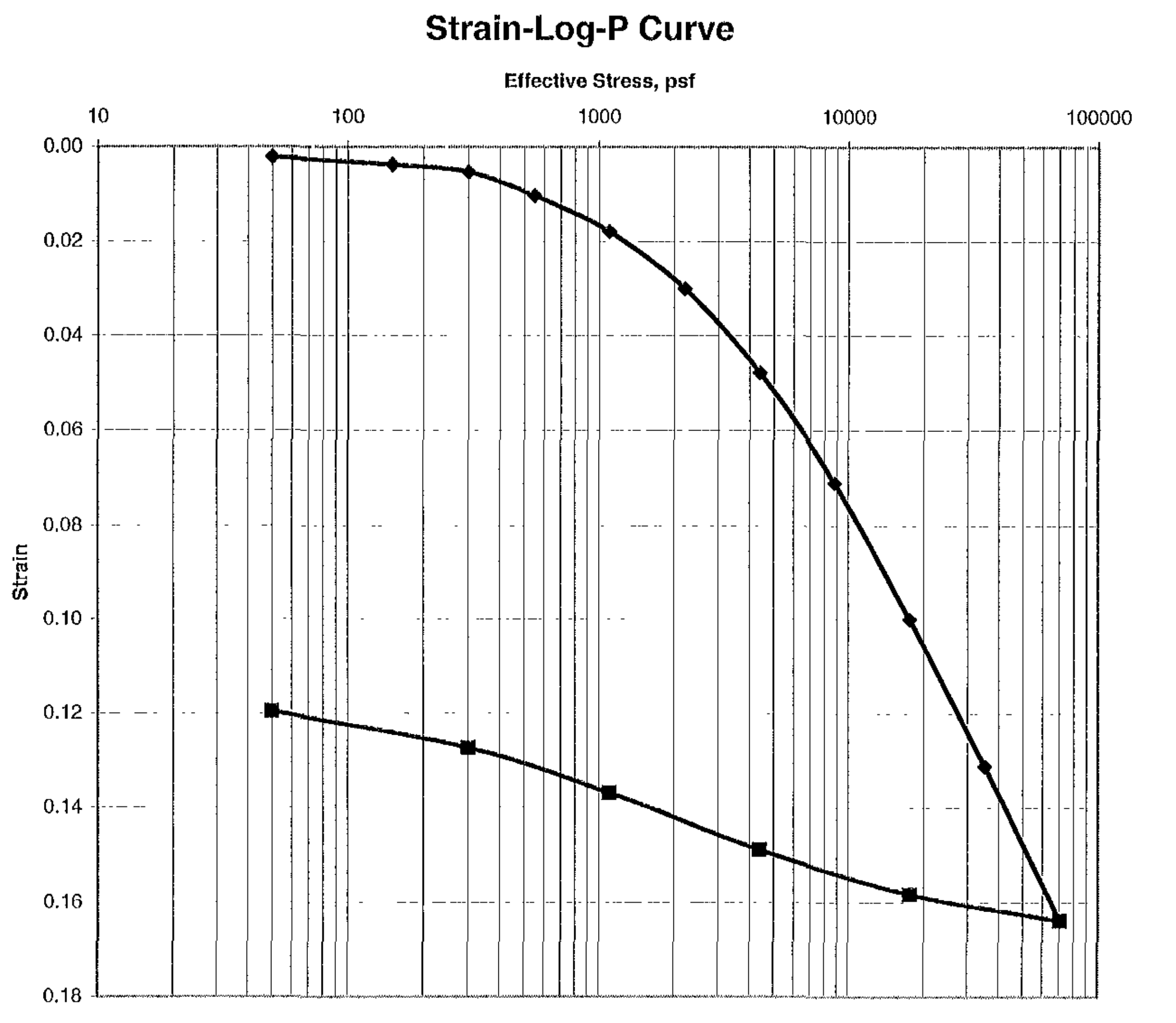
Remarks:

COOPER TESTING LABORATORY

Consolidation Test

ASTM D2435

Job No.:	010-831	**Boring:**	2	**Run By:**	MD
Client:	Treadwell & Rollo	**Sample:**	4	**Reduced:**	DC
Project:	3918.01	**Depth':**	9'	**Checked:**	DC
Soil Type:	Olive-gray Sandy CLAY, (silty)			**Date:**	6/7/2004



Ass. Gs = 2.7	**Initial**	**Final**
Moisture %:	21.0	16.5
Density, pcf:	104.7	116.6
Void Ratio:	0.610	0.445
% Saturation:	92.8	100

Remarks:

Treadwell&Rollo

DISTRIBUTION

6 copies:	Mr. Mark Rogge City of Milpitas 455 East Calaveras Boulevard Milpitas, California 95035
1 copy:	Mr. Tom Yousch Swinerton Management & Consulting 455 East Calaveras Boulevard Milpitas, California 95035

QUALITY CONTROL REVIEWER

for

Richard D. Rodgers, G.E.
Principal